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DENTAL SURGERY.



DENTAL SURGERY

FOR

PRACTITIONERS AND STUDENTS

BY

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DENTAL SURGEON TO THE LONDON HOSPITAL.

PHILADELPHIA

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PREFACE.

HAVING stated as concisely as possible the substance of what for several years I have been teaching to students of medicine in the Dental Department of the London Hospital, I venture to hope that this small book may prove useful to the busy medical practitioner, too much occupied to study larger and more exhaustive works on Dental Surgery.

To such matters as the filling of teeth with gold, the pivoting of mineral crowns, and to others which fall only within the scope of the specialist, reference is intentionally omitted. My aim throughout has been to give upon dental matters as much practical information, and no more, as may suffice the student of medicine in the after work of his profession.

To the practice and teaching of my uncle, H. J. Barrett, I am mostly indebted for what may be found to possess value in these pages; and to my brother, S. E. Barrett, my thanks are due for his assistance in revising the proof sheets. For the illustrations of Dental Forceps, I am obliged to the courtesy of Messrs. Ash and Co.

A. W. BARRETT.

42 FINSBURY SQUARE,
LONDON, E.C.

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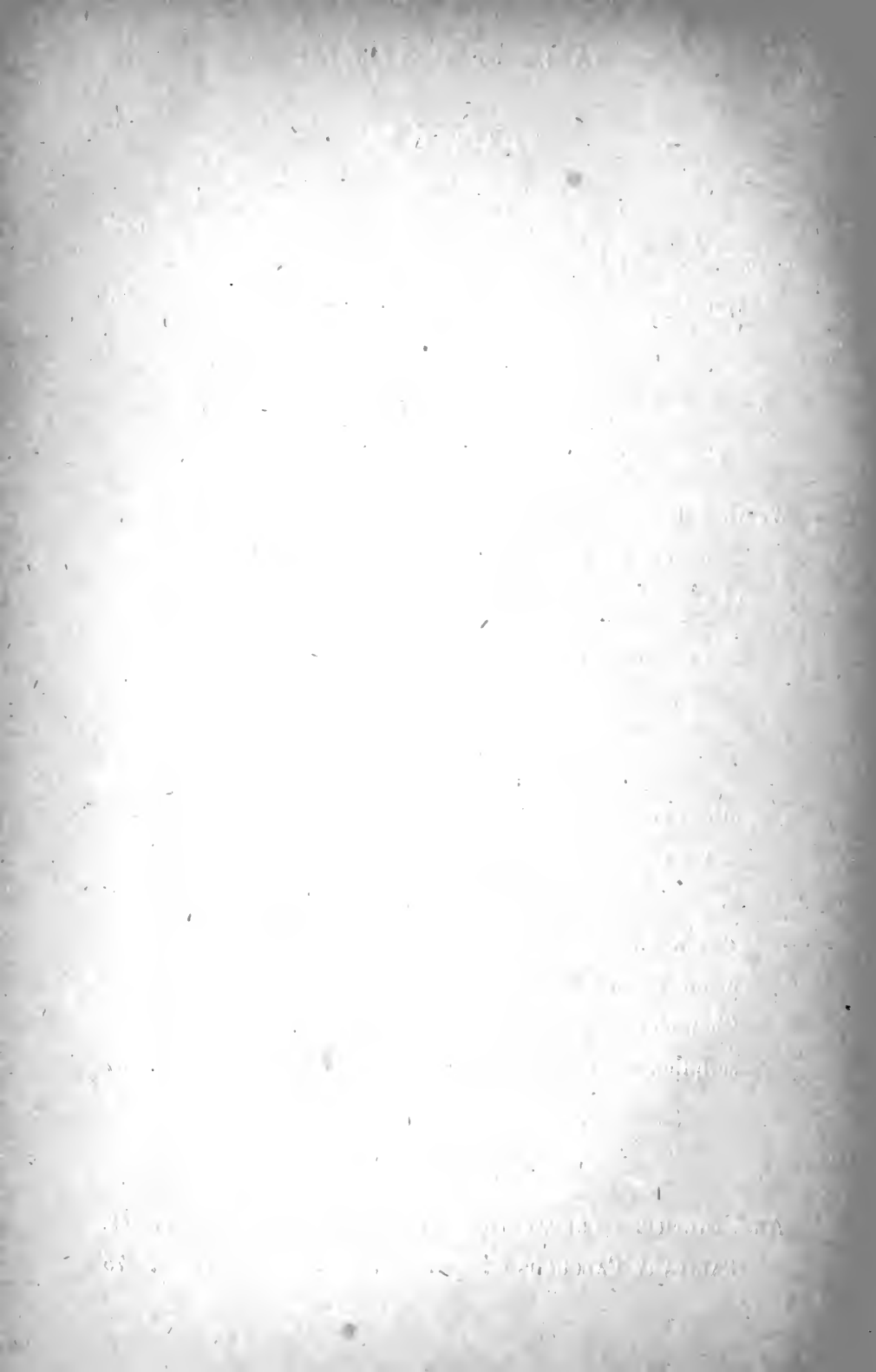
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ERRATUM.

Page 45, line 3 from bottom, and page 56, last line,
for *Rhizodontrophy* read *Rhizodontropy*.

DENTAL SURGERY.

CHAPTER I.

THE FIRST DENTITION.

ERUPTION OF TEMPORARY TEETH. LANCING THE GUMS.

ABSORPTION OF TEMPORARY FANGS. WHEN TO EXTRACT
TEMPORARY TEETH FOR RELIEF OF IRREGULARITY.

UNDESIRABILITY OF EXTRACTING TEMPORARY TEETH.

ULCERATION THROUGH THE GUMS OF TEMPORARY FANGS.

THE temporary teeth are twenty in number, and their eruption usually begins and ends between the ages of six months and two and a half years. The following table gives the order and times of cutting of the various members of this series.

The 2 Lower Central Incisors, about 6th Month.

„ 2 Upper	„	„	„	8th	„
„ 2 Lower Lateral	„	„	„	10th	„
„ 2 Upper	„	„	„	12th	„
„ 4 1st Molars	„	16th	„
„ 4 Canines	„	20th	„
„ 4 2nd Molars	„	30th	„

The protrusion of the tough unyielding gum by a growing tooth is apt at times to be attended with much suffer-

ing, evinced by a greatly increased flow of saliva, with febrile symptoms and convulsive movements. Relief may be then afforded by passing a well protected lancet through the whitened nodule of gum down to the erupting crown. Such an operation should, however, be performed only when the mucous membrane of the mouth is in a healthy condition, and when also it is quite evident to the sense of touch, that the cutting edge of the new tooth is bound down by the tense and fibrous gum.

At the age of four years absorption of the fangs of the temporary teeth commences and those of the incisors are first attacked. This process, in its nature purely vital and in no way mechanical, is brought about by the action of the Absorptive Papilla, a mass of many nucleated cells that lies closely behind and eating into each temporary fang, and intervening between the latter and the crown of its permanent successor.

A growing permanent tooth is placed immediately *behind* and *below* the fang of each temporary incisor and canine, while *underneath* each temporary molar, and embraced within its widely diverging fangs, is the crown of the bicuspid that is to take its place. A knowledge of the latter fact is of value when it becomes necessary to extract a temporary molar, and the forceps should then be applied with caution and not thrust deeply into the alveolus, lest the permanent be taken out with the temporary tooth.

It is not often necessary to extract a temporary tooth to make room for its permanent successor, since the rapid development of the jaw and consequent expansion of the alveolar arch that occurs during childhood tends to per-

mit permanent teeth to fall into their normal situations, although at the time of, and shortly after their eruption, they may have been crowded out of line. Under these circumstances, however, the extraction of a temporary tooth for the relief of irregularity may become necessary. If such a tooth or its decayed fang be retained considerably after the time at which it should normally be shed, while an unusual degree of fixity in its socket shows that the action of the Absorptive Papilla upon its fang has been but slight; if also the eruption of the crown of its permanent successor has well advanced, while the line in which the latter is growing diverges considerably from its normal direction; if these conditions be present the obstructing temporary tooth may with advantage be removed. It becomes quite necessary that this should be done when the irregularity

FIG. 1.

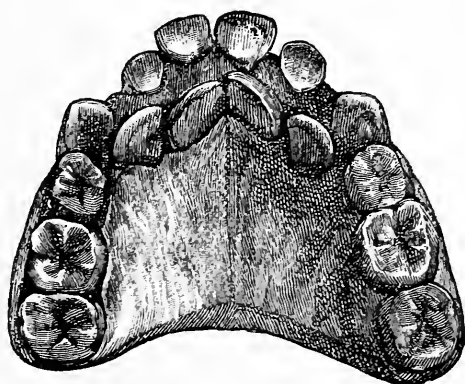


Diagram from a cast of the upper jaw of a neglected mouth in a child aged eight. The four permanent incisors have erupted, so that they bite within and behind the lower teeth when the mouth is closed. The four temporary are unduly retained with their fangs but slightly absorbed.

occurs among the upper front teeth, for if a permanent Upper Incisor or Canine be allowed to grow so irregularly that when fully erupted it bites behind the lower teeth, it becomes necessary to adopt a course of tedious dental treatment that might have been avoided by a timely removal of a temporary tooth.

The temporary molars are prone to early and rapid decay; their dental pulps are large, highly sensitive, and ready, as the result of such quickly advancing caries, to take on a process of destructive inflammation, thus becoming rapidly devitalized and decomposed. The treatment, however, of decay with its sequelæ among temporary and permanent teeth must be referred to later on. Suffice it now to say that a badly developed and carious set of permanent teeth does in no way necessarily occur in a mouth which may have been conspicuous by the faulty character of its milk teeth. Also it should be noted that temporary molars should never be extracted save as a last resource and when every attempt to relieve pain by other means has failed. Small cavities occurring in them, should if possible be filled before decay has encroached greatly upon their walls, and in so doing it is well always to avoid causing pain to the child. Carious dentine and enamel should be very lightly removed, and for the stopping of the cavity such a material as gutta-percha gently warmed over a candle flame, or cotton wool that has been dipped into a solution of gum mastic in alcohol, answers admirably. Decay when more advanced, with death of the pulp resulting, may necessitate other treatment; but always this should be remembered, that a broken down temporary

molar, if only it be not causing pain, is better than none at all and may be invaluable to the child for the mastication of its food and the due nutrition of its body.

It has been said that it is occasionally necessary to extract temporary teeth to prevent irregularity. Under these conditions also they may require to be removed ; when as the result of the absorption of the posterior surfaces of their fangs, the sharp ragged ends so resulting have ulcerated through the gum and have wounded the lip or cheek. The laceration and inflammation of the soft parts is apt to be more severe when it results from a lower than when caused by an upper fang, owing to the greater mobility of the tissues around the former. The trouble of course ceases as soon as the cause is recognised and removed, but the condition should be carefully noted, lest it be wrongly attributed to necrosis and exfoliation of a portion of the maxilla.

CHAPTER II.

THE SECOND DENTITION.

ORDER OF ERUPTION OF PERMANENT TEETH. ERUPTION OF WISDOM TEETH. DIAGRAMS OF TEETH AT THREE PERIODS OF CHILDHOOD. HOW TO DISTINGUISH BETWEEN TEMPORARY AND PERMANENT TEETH.

The order and times of eruption of the permanent teeth are as follows :—

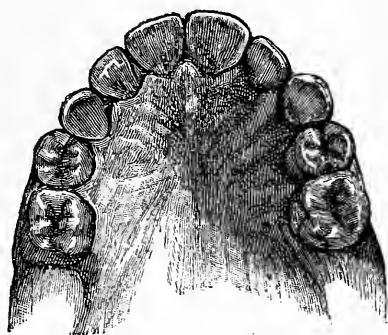
The 4 1st Molars	at about the	6th year.
„ 2 Lower Central Incisors	„ „	7th „
„ 2 Upper „ „	„ „	8th „
„ 4 Lateral Incisors	„ „	9th „
„ 4 1st Bicuspid	„ „	10th „
„ 4 2nd „	„ „	11th „
„ 4 Canines	„ „	12th „
„ 4 2nd Molars	„ „	13th „
„ 4 3rd Molars	„ „	20th „

As a rule but little local or general disturbance attends the eruption of the permanent teeth. They grow up *behind* their temporary predecessors which in due course become loosened and are shed. And thus the process is quietly effected without attracting much notice.

The cutting of the lower wisdom tooth is often, however,

attended with a good deal of suffering. A flap of gum is lifted up by its growing crown and between this last and the upper second molar the gum structure is liable to be bruised during mastication. Relief may at times be given by incising the constricting tissue and by touching the incised surface lightly with nitrate of silver. Usually the pain and inflammation subside in the course of a few days, and the treatment of such cases may generally be limited to the use of hot fomentations inside the mouth. If, however, the erupting third molar be impacted between the base of the coronoid process and the back of the second molar its

FIG. 2.



At the age of three years showing the ten upper temporary teeth.

Two Temporary Central Incisors.

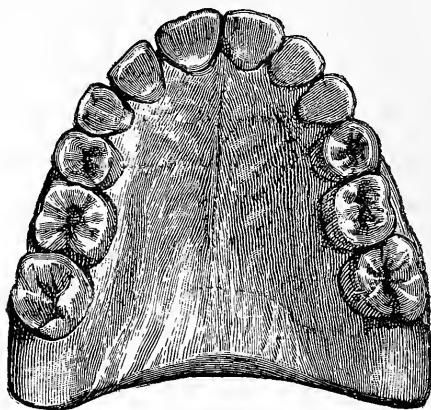
„	„	Lateral	„
„	„	Canines.	
„	„	1st Molars.	
„	„	2nd Molars.	

extraction may become necessary, and if this be found to be quite impracticable it may be needful to remove the second molar to give relief. It should of course be borne

in mind that a second molar is perhaps more useful and durable than any other tooth in the mouth, so that its extraction should be regarded as quite a last resource.

The accompanying diagrams represent the upper teeth at three characteristic periods of childhood.

FIG. 3.



At the age of seven years, showing the ten above mentioned temporary teeth, and also the recently erupted 1st permanent or six year old molars.

Two Temporary Central Incisors.

„ „ Lateral „

„ „ Canines.

„ „ 1st Molars.

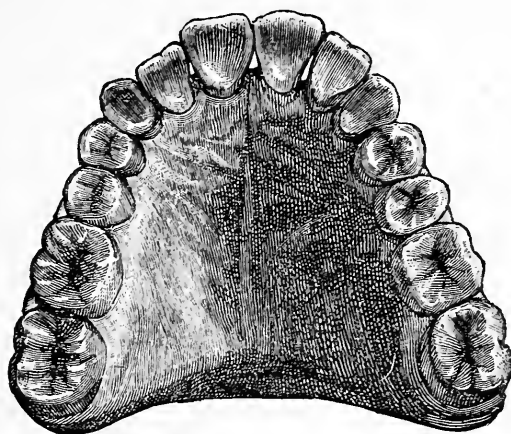
„ „ 2nd Molars.

„ Permanent 1st Molars.

The need for being able to decide on examining a mouth, whether any given tooth be temporary or permanent is evident. As a rule there is no difficulty in so doing. The permanent incisors are larger and more yellow in tint than those of the milk dentition, while their cutting edges are serrated for a year or two after eruption. Later on the

serrations become obliterated, as occurs among young milk teeth which are soon worn smooth by the friction of eating. The bicuspid's can not easily be mistaken for the temporary

FIG. 4.



At the age of thirteen years, showing the fourteen upper permanent teeth. All the temporary teeth have been replaced by their ten corresponding permanent ones, and also the 1st and 2nd permanent molars have been cut. The six temporary incisors and canines have been replaced by the six permanent incisors and canines; and the four temporary molars have been replaced by the four bicuspid's.

Two Permanent Central Incisors.

„	„	Lateral „
„	„	Canines.
„	„	1st Bicuspid's.
„	„	2nd Bicuspid's.
„	„	1st Molars.
„	„	2nd Molars.

molars which they replace, but it is well to guard against extracting a permanent canine tooth under the impression that it is the corresponding temporary one, and also the first permanent molar should not be mistaken for the second temporary one.

CHAPTER III.

ABNORMALITIES IN DEVELOPMENT OF
PERMANENT TEETH.

RETARDED ERUPTION. SUPERNUMERARY TEETH. ABORTIVE
TEETH. DILACERATED AND GEMINATED TEETH. HONEY-
COMBED AND SYPHILITIC TEETH.

Retarded eruption.—The cutting of a permanent tooth may be delayed long after the normal time, or its absence may continue through life. To teeth thus buried and but partly developed have been attributed myeloid and other growths which have been found within the maxillæ in their neighbourhood. Whether it be true or not that such tumours have arisen from such causes, the author is unable to say, but he is inclined to believe the dental irregularity to have been merely a coincidence with, or even a result of, the progress of the diseased growth. At times an incisor or canine tooth may remain throughout life embedded in the the palatine process of the upper maxilla or but partially erupted from its lower surface. A lower wisdom tooth has been removed from the cheek, near the angle of the jaw, where its late eruption caused much distress and deformity.

Irregularity in excess of the normal number.—Such additional teeth are Supernumeraries. They are usually found in the front of the mouth, in the neighbourhood of the upper

permanent incisors, among which by their presence they may cause a good deal of irregularity. Supernumerary teeth are more or less conical, with stunted fangs. As a

FIG. 5.

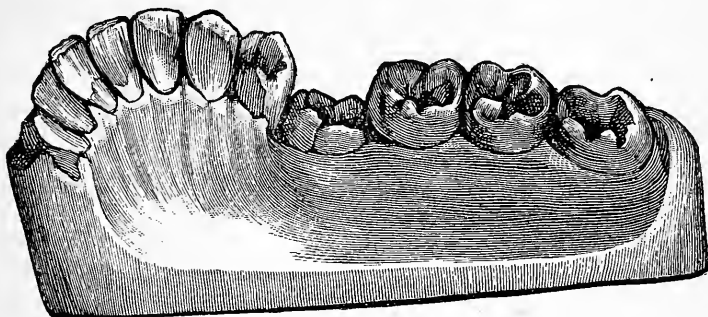


Diagram of a model of the right side of a lower jaw aged 36. All the lower permanent teeth are erupted with the exception of the 2nd bicuspid. The 2nd temporary molar is retained and serves to illustrate the difference in level between the temporary and permanent series.

FIG 6.

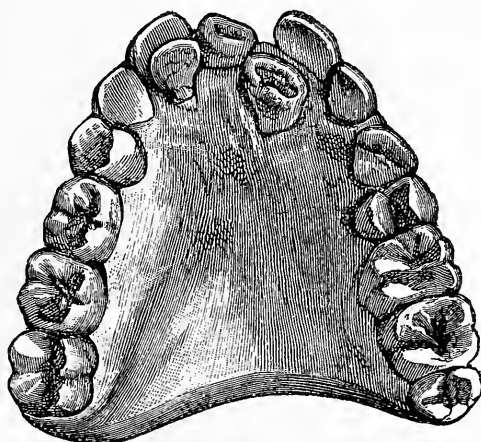


Diagram of a mouth aged 13. In the front of the mouth are two supernumerary teeth which are displacing permanent incisors from their rightful positions.

rule it is well to extract them, if by their presence they are causing the normally developed teeth to take up improper positions in the dental arch.

Abortive Teeth.—A tooth though normally placed in the series may be irregular in form. Annexed is a drawing of a permanent central incisor, or of what corresponded there with, which was removed on account of its deformity from a patient in the dental department of the London Hospital.

FIG. 7.



Further as the result of developmental irregularity, the long axis of a tooth may be bent at an angle near its neck, when it is said to be *dilacerated*. Also two adjacent teeth may be *geminated*, or united by their adjacent surfaces, the union being sometimes so complete that they have but one common pulp cavity.

FIG. 8.



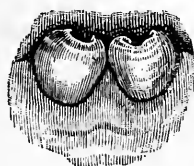
Two lower temporary incisors united by
cementum on their adjacent sides.

Certain structural defects may be evident among all the teeth of the permanent series.

Honeycombed or Strumous Teeth.—The incisors and first molars most often present the appearance of such. These are dark-yellow in colour and deeply pitted or ridged transversely upon their surfaces, as though the deposition of enamel had been injuriously affected during the development of the organs. The inheritance of a strumous diathesis, or overdosing with mercury in early childhood, have both been said to have induced this condition, but its cause is still obscure. A careful distinction must be drawn between this and the following abnormality.

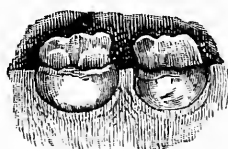
Syphilitic or Specific Teeth.—These, the result of inheritance of the syphilitic taint, show the following well marked characteristics :—One crescentic notch in the middle of the cutting edges of the upper and lower permanent incisors. These teeth are also separated from each other ; are of dark colour, and of peg-top shape. The development of the bicuspid and molars is also modified, but the central notch of the incisors is most typical of the diathesis. The temporary teeth of children with syphilitic parentage present no peculiar traits. The annexed two diagrams are

FIG. 9.



Syphilitic Incisors.

FIG. 10.



Honeycombed Incisors.

from drawings by Mr. Hutchinson, and show the features of typically marked honeycombed and syphilitic permanent upper central incisor teeth.

CHAPTER IV.

IRREGULARITY IN THE POSITIONS OF THE
PERMANENT TEETH.

CAUSE OF IRREGULARITY AMONG TEETH OF THE PRESENT TIME. TREATMENT OF IRREGULARITY BY EXTRACTION AND THE REGULATING PLATE. SYMMETRICAL EXTRACTION. SIX COMMON FORMS OF IRREGULARITY:—1. UNDERHUNG INCISORS; 2. ROTATED INCISORS; 3. PROJECTING AND DIVERGING INCISORS; 4. PROJECTING CANINES; 5. THE V-SHAPED DENTAL ARCH; 6. IRREGULAR ARTICULATION OF UPPER WITH LOWER TEETH. THE EXCAVATOR AND THE MOUTH MIRROR.

Irregularity in the arrangement of the permanent teeth is among civilized races greatly on the increase, and its cause may be found in the lessened work thrown upon the organs of mastication by the appliances and requirements of modern life, whence results decreased development of both teeth and jaws. But while the shape size and number of the teeth has not undergone much change, with the exception of the wisdom-tooth which is now more variable and less developed than in skulls of earlier date, we find that the development of the maxillary bones is frequently far less complete than in the older periods of man's history. So, with a stunted alveolus and

teeth of normal size, overlapping and crowding of the latter too often ensues.

Such irregularities are so varied that an altogether satisfactory method of classifying them is not very practicable. The common and typical deformities are therefore only described and it must be noted that any one may co-exist with other forms. Irregular and overlapping teeth when occurring in the front of the upper jaw are more unsightly than when they are found in the lower, but under all circumstances it is desirable that the teeth should be evenly arranged in the maxillæ. Behind projections and between overlapping teeth the food that always collects and is apt to escape the cleansing action of the tooth brush will certainly decompose and thus favour the attack of caries.

For the curing of irregularity, we have two methods of treatment which may be applied singly or combined ; we may extract teeth to give additional room, or we may employ a regulating plate to produce a like effect by forcing the teeth outwards and so expanding the dental arch. If extraction alone be practised these points should be noted. The front teeth, and especially the canines, should if possible be spared, since the loss of the two upper eye teeth is apt to alter the appearance of the face by the considerable absorption of alveolar process that follows their extraction and the consequent sinking in of the angle of the mouth. The canines moreover have more value for purposes of mastication than other front teeth, since they are less liable to decay and are more firmly implanted in the alveolar sockets. Before deciding which teeth may best be spared careful examination of the mouth with the assistance of a fine excavator and a mouth mirror should be made.

If all bicuspid and molars be well developed and free from decay then the best and speediest mode of curing the irregularity may be by the removal of the two upper and possibly also of the two lower first bicuspid. But if as is more likely to be the case, decay be present among the first permanent molars, two or four of these should be extracted. It is upon these teeth that the choice will probably fall since, from a cause that has not yet been ascertained, dental decay is more prevalent and commences earlier among the first molars than among other teeth.

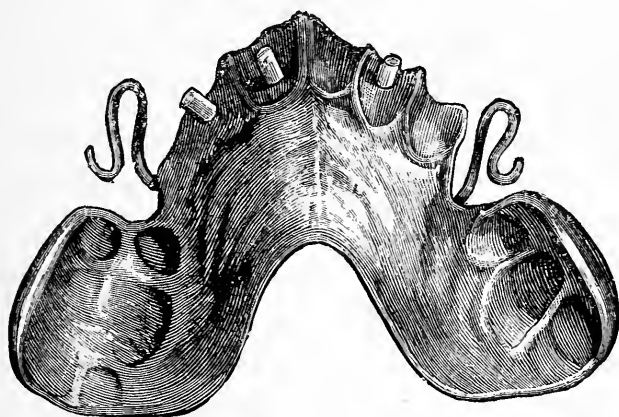
Such extraction should be practised symmetrically. If an upper molar or bicuspid on one side be removed, then also the corresponding tooth on the other side of the mouth should be taken out ; or if of the four six-year-old molars, or of the four 1st bicuspid, two only, an upper on the right and a lower on the left, be decayed, or if three of the series be carious and the other sound, then the extraction should be completed as regards all four corresponding teeth. Thus from a timely and judicious symmetrical extraction will often follow a natural and symmetrical regulation of the crowded front teeth, and the forces tending to bring this about are the continuous pressure exerted upon the dental arches by the lips and muscles of the face and the tongue.

If then it be advised to part with four 1st molars, the time most suited for such extraction is that at which the four 2nd, or 12-year-old, molars are just erupting. The latter then advance and in two years time the spaces resulting from extraction are nearly obliterated. Although the removal of four decayed first molars may hardly serve of itself to materially alter the positions of much overlapping

front teeth, yet the additional room thus gained in the mouth can not but be salutary, since the increase of the irregularity from the pressing forward of erupting and advancing back teeth is certainly arrested. Also the more perfect cleansing and polishing of the sides of bicuspid and molars which is rendered practicable by the slight separation that ensues among them conduces very greatly to their ultimate preservation from caries.

The regulating plate, usually of vulcanite or gold, is constructed by the dentist to a plaster model of the jaw with its contained irregular teeth. Such a plate carries elastic gold wires which looping over the outstanding teeth serve to draw them back into line, and also if needed it may contain small wooden pegs to press upon the posterior surfaces

FIG. 11.



Vulcanite regulating plate for treatment of irregularity among the upper front teeth, showing the gold wires and wooden pegs referred to.

of back-standing teeth. Thus by the forcing of these outwards the dental arch is expanded and increased room obtained for the reduction of any irregularity.

During the wearing of all regulating plates great cleanliness should be observed; the teeth being brushed with soap and water each morning and evening, and the plate being taken from the mouth after every meal to be brushed in like manner on both surfaces. If this be done a regulating plate may be safely worn for several months, but if it be omitted the acid produced by decomposition of food and saliva will shortly soften and erode the crowns of the teeth.

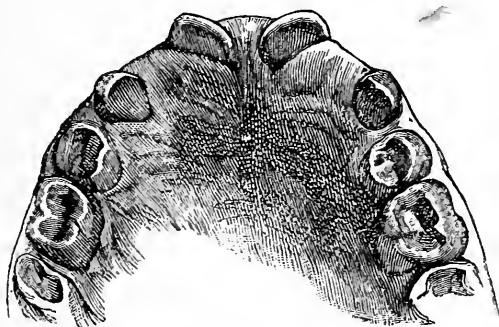
The irregularities most often met with are as follows:—

1. One or more permanent incisors may be erupted considerably behind the line of their neighbours, as the result of undue retention of temporary teeth (*vide* fig. 1, Chap. I). This may be prevented by the judicious removal of the latter when required, but if the abnormality happen to upper front teeth these may be found to be underhung, or to bite behind the lower incisors when the jaws are closed. In this last case a regulating plate (*vide* fig. 11) must be worn for three or four weeks, which shall force out with the aid of steel screws, or a series of wooden pegs each longer than its predecessor, the back-standing tooth or teeth. That this may be effected the jaws must be kept a little apart by carrying the vulcanite plate over the masticating surface of the molars and bicuspid, and but a short course of such treatment will be needed to push forward the back-standing upper incisor, so that its lower antagonist shall close behind rather than, as was the case before treatment commenced, in front of it. As soon as this changed condition is brought about the regulating frame may be left off, since the misplaced tooth cannot relapse into its old posi-

tion, and the closure of the lower jaw upon the upper will shortly induce a symmetrical arrangement of the upper front teeth.

2. An incisor tooth may be partly rotated on its long axis (*vide* fig. 12). This should be treated with a regulating plate constructed to draw back, by the aid of a gold wire, the projecting margin, and with a wooden peg to push out the side of the tooth that is so rotated inwards. A few years back it was not unusual to forcibly turn such teeth into proper position with the aid of forceps. This course is not to be recommended, as the disruption that it causes to the nerves and vessels entering the tooth at the end of its fang is very liable to induce death and early loss of the organ.

FIG. 12.

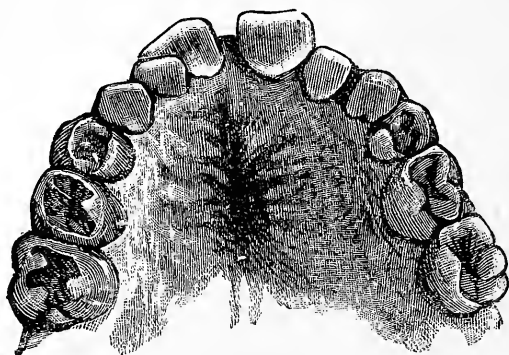


Model of upper jaw with rotated incisors.

3. The upper incisor teeth may be widely spaced and divergent (*vide* fig. 13). Such cases are best treated by the dental surgeon, who, if there be no obstacle to regulation, such as a pressure upon their back surfaces of the lower incisors, may draw in two divergent centrals by placing around their necks a thin elastic band. It must be noted that such treatment needs close watching, and

the band must be prevented from forcing itself up the necks of the teeth beneath the gum by attaching to it one or more gold wire loops, which may be hooked over the cutting edges of the teeth that are being operated upon. If this be neglected the latter will certainly be loosened and will probably be lost.

FIG. 13.

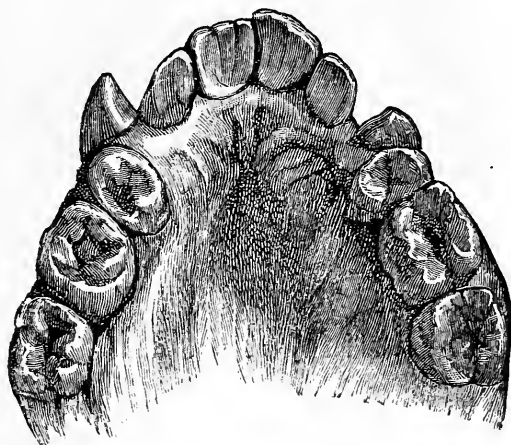


Model of upper teeth with widely spaced and divergent incisors.

4. The canines may greatly project while the incisors are overlapping (*vide* fig. 14). This is a very common form of irregularity, and is doubtless favoured by the later eruption of the eye-teeth, as compared with that of the incisors and bicuspid, whereby the former find the spaces into which they should normally fall in the dental arch closed to their admission by the approximation of the lateral incisors with the first bicuspid. In such an irregularity much improvement may be hoped for with time and during that growth and expansion of the maxillæ which continues for a few years after the canines are erupted. Should this, however, seem insufficient to provide such space as may be required by the projecting eye-teeth it will be necessary to extract

first bicuspid, and into the gaps caused by their removal the former will in all probability be conducted by the gentle but continuous pressure upon their outer surfaces of the muscles of the lips and cheeks. More complete symmetry may with certainty be given to the dental arch if, in addition to extraction of bicuspid, a vulcanite regulating plate be employed for a few weeks to draw back the canines, and at the same time to push out into a symmetrical curve the irregular and crowded incisor teeth.

FIG. 14.

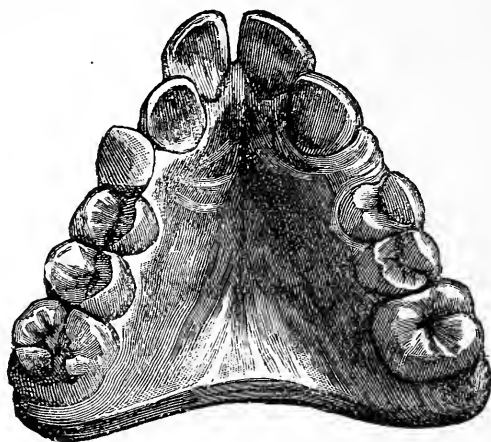


Model of upper jaw, aged 14 years. The canines are projecting but these were subsequently drawn backwards and inwards by a dental plate into the spaces caused by the removal of the first bicuspid. At the same time the four incisors were pushed slightly outwards by wooden pegs connected with the frame. The model was taken a month after removal of the two 1st bicuspid.

5. A V-shaped dental arch may be combined with a deeply vaulted palate (*vide* fig. 15), and this form of irregularity is often associated with congenital idiocy. The upper

teeth are here found to be arranged along two more or less straight lines converging towards and meeting at the front of the mouth. Treatment should go in the direction of expanding the arch by regulating plates, and of gaining additional room by a judicious thinning out of bicuspid or first molars.

FIG. 15.



Model of a V-shaped upper jaw. This was co-existing with a vaulted palate and idiocy of a congenital nature.

The V-shaped arch, and the form of irregularity to be next described, are frequently transmitted by inheritance, and it is not unusual to find a like defect among all the children of parents presenting either of these deformities. It cannot be disputed that such errors in maxillary development are infinitely more frequent among civilized than among savage races, and though the V-shaped arch and a deeply vaulted palate may co-exist with well developed cerebral organs, yet, as Dr. Langdon Down has pointed out, (*Transactions of Odontological Society*, 1871), it is extremely

common to find such well marked defects in the mouths of congenital idiots, and this, as the same authority has stated, possesses practical value. Given a V-shaped arch and vaulted palate in the mouth of an idiot, we may assume that the defective development in mouth and brain results from a cause which acted prior to the birth of the patient; that the idiocy was congenital. If, on the other hand, a normally developed mouth co-exist with idiocy it is probable that the latter was acquired after birth. Concerning the treatment of the former a more favourable prognosis may be given, since a brain imperfectly developed is more amenable to treatment than one whose functions have been impaired by some grave lesion induced after birth.

6. In a less common form of irregularity, which like the V-shaped arch is frequently hereditary, we find the cutting edges of the lower incisors set at a level higher than that of the grinding surfaces of the lower bicuspid and molars. As a result of this the upper incisors are gradually bitten out and loosened by the pressure upon their backs of the lower teeth whenever the jaws are closed.

In a case such as this, lately under treatment, the only plan that promised ultimately to be successful in preventing the loss of the two upper central incisors was to adapt a thin gold plate to the grinding surfaces of the lower masticating teeth, and thus the lower front teeth were kept out of reach of the upper ones which they were rapidly destroying. Before the wearing of this plate, which served only to prevent increase in the irregularity and in no way tended to reduce it, a prolonged but quite unsuccessful attempt to improve the positions of the upper and lower teeth had

been made. The four first bicuspid's had been removed; the lower incisors had been slightly shortened by filing away a little from their cutting edges; the lower incisors with the lower canines had been drawn back by a vulcanite regulating plate; this being effected, the projecting upper incisors and canines were then drawn in by the continuous and gentle contraction of an elastic band passed round the back of the head and attached to each end of a narrow gold band that impinged upon the front surfaces of the six projecting upper front teeth. By this prolonged treatment the irregularity was almost entirely cured, but on discontinuing the apparatus the case unfortunately relapsed into something much like its first condition, through the renewed pressure upon the backs of the upper front teeth of the cutting edges of the lower ones. From this it may be inferred that malformations of this nature are less amenable to treatment than those spoken of before.

FIG. 16.



An excavator for use in examination of teeth and preparation of cavities.

The *Excavator* (*vide* fig. 16) should be strong and well tempered, so that it may neither readily bend nor break. While the operator is conveying it towards the patient's face and into his mouth, its cutting edge should be pressed firmly against the end of the second finger, that there may be no chance of wounding either face or eyes by any incautious

movement on the part of the patient. The excavator may be used as a probe to search for half concealed stumps, or to explore a cavity in a carious tooth. In doing the last

FIG. 17.



A mouth mirror for use in examination of the teeth.

guard against wounding a sensitive dental pulp and so inflicting much unnecessary pain. Also the excavator may be employed to prepare a cavity for the reception of a

gutta-percha or other stopping by cutting away softened and decayed tooth structure. It may be used to carry into the mouth a dressing of absorbent wool, which may be used as a mop to remove blood or saliva from the part to be operated upon. Also the excavator is of great value in enabling us to learn if the tooth to be extracted is rigidly implanted in the maxilla or is at all moveable. When used thus, the instrument, which should be a specially strong one, should rest upon a solid part of the crown of the tooth, and thus, with a very small amount of force, most teeth may be slightly moved laterally to and fro. Such mobility may teach the operator that no special difficulty is to be expected in the removal of the tooth; but if the latter be glued down into its socket by inflammatory exudation, or if its fangs be solidly implanted in a massive and unyielding maxilla, we shall not succeed in producing any movement of its crown by manipulation with the excavator.

The *Mouth Mirror* (*vide* fig. 17) is of value when it is desired to reflect a ray of light upon some obscure situation in the mouth, and also for showing cavities in the backs of molar teeth. It is well before its use to slightly warm it in hot water, or over the lamp, in order that its face may not be clouded by moisture condensed from the breath.

CHAPTER V.

DENTAL CARIES.

TENDENCY OF TEETH TO BECOME RUDIMENTARY. LOCAL AND GENERAL CAUSES OF DECAY. TWO VARIETIES OF CARIES. LIABILITY OF VARIOUS TEETH TO DECAY. GENERAL DIRECTIONS AS TO TREATMENT OF CARIES. SYMPTOMS AND TREATMENT OF CARIES IN ITS FIRST STAGE. CARIES IN ITS SECOND STAGE, WITH ANTISEPTIC TREATMENT OF THE PULP CAVITY AND SYMPTOMS AND TREATMENT OF PERIODONTITIS AND ALVEOLAR ABSCESS. CARIES IN ITS THIRD STAGE, WITH CONTRACTION OF TEMPORO-MAXILLARY ARTICULATION AND FISTULOUS OPENING THROUGH CHEEK.

Dental decay is far more prevalent among the civilized races of the present day than among the aboriginal tribes of Africa, America, and Australia; also an examination of ancient skulls proves it to be one of the incidents of advancing civilization. This is the outcome of several causes: such as the preservation of the weakly and their greater reproduction that now obtains; the general lessening of bodily vigour and development that is apt to go with increased mental cultivation; and the smaller need for dental organs that comes from improvement in the quality and preparation of modern food. It is perhaps not easy to say what degree of value should be set upon this last, but certain it is that the teeth and jaws of to-day have far less work thrown upon them than in times when man lived upon roots and imper-

fectly prepared coarse flesh, and we may assume that the development of the teeth, as of other organs, varies with the amount of labour they are called upon to perform. The frequent absence of one or more third molars, their often late eruption, and their commonly dwarfed size; the increase of dental caries; and the tendency to early shedding of the teeth from absorption of their alveolar sockets, all suggest that the dental organs of civilized man are tending to become rudimentary.

The local conditions predisposing to decay are twofold; defective development of dentine and enamel, and abrasion and crushing of the latter from overcrowding of the teeth. If either condition be present the tooth, like a badly built house, admits moisture into its interior. The evidence of defective development may be found in those linear cracks between the cusps of molars and bicuspid, or upon the back surfaces of upper lateral incisors, which a careful scrutiny will often reveal shortly after their eruption. The abrasion of enamel which favours decay occurs in crowded mouths upon the lateral surfaces of bicuspid, which by their slight mobility during mastication are rendered liable to such injury. With such defects present in the structure of a tooth it is certain that saliva and debris of food will find their way into its interior, there to decompose and generate those acids which serve to dissolve out its lime salts. Dental decay consists essentially in the solution and separation of the earthy or inorganic salts of a tooth, from its animal matrix, and chiefly of this last does carious dentine consist. The reaction of the latter is markedly acid to litmus paper, and microscopic examina-

tion reveals upon its surface, and within its tissue, a copious development of the cryptogam, *Leptothryx Buccalis*, the sporules of which penetrate into and between the dentinal tubules. Although the existence of this is perhaps not essential to decay, since a healthy tooth may be decalcified by immersion in acetic acid, yet we may believe that the growth of the cryptogam favours the decomposition of the dentine by exercising upon it such a catalytic action as is induced by the introduction of the yeast plant into a saccharine solution. The dentine of a tooth is always more prone to decay than its enamel, and while the latter is solid and free from defects a tooth will always withstand such injurious influence as may be brought to bear upon it.

As a rule decay radiates throughout the dentine from the bottom of enamel flaws, and the presence of mischief is often not revealed by pain or other symptoms until the force of mastication crushes in the roof of enamel that arches over a mass of yielding and disintegrated dentine. Caries will at times take another form and appear as a general softening of enamel and dentine around the necks of various teeth. Such a condition is apt to occur about the middle period of life when the recession of the gums and commencing absorption of the edges of the alveolar plates expose to the action of the saliva the softer and less durable cementum that coats the fangs.

The tendency to caries shown by various teeth differs greatly. Those most liable to it are the four six-year-old molars, and of all decayed teeth extracted by the operator about one third will belong to this series. Those least liable to this disease are the four lower incisors and two

lower canines, but why the development of the six last should be more complete than that of the four former is at present unknown. The fact, however, remains and to it we may attribute their far greater longevity.

With the condition of the health generally the tendency to decay naturally varies, and so our efforts to combat the latter should be both general and local in their nature. The local treatment of a carious tooth should have a double aim; firstly, to relieve the toothache which is usually the exciting cause of our patient's visit; secondly, to preserve the tooth usefully and to retard or prevent the extension of caries. It is evident that the insertion of gold fillings, which is usually the most successful way of effecting the last, is as much outside the work of a medical practitioner as is the making of plates for artificial teeth. Indeed, the filling of a tooth with any material, be it oxychloride of zinc, amalgam, or gold, in such a way as to make a perfectly water-tight durable plug that shall with certainty prevent any extension of disease for a number of years, must come within the scope only of such practitioners as devote their whole time to such work. Still much remains that a doctor may do for a patient who is unable to visit a specialist. He may by treatment of the tooth, or its extraction, relieve pain, and he may usefully prolong its existence, though he can hardly hope to permanently save it, by carefully filling the carious cavity with a plug of gutta-percha or wool and mastic.

The course of dental caries varies greatly in duration with the habits, health, and age of the patient, being most rapid for a few years after the attainment of puberty.

We may divide it into three stages. Each of these conditions presents well-marked and unvarying characters, and familiarity with them is the more necessary since treatment that serves to relieve pain from caries in its first stage would, if adopted in the second, make matters very much worse.

CARIES IN ITS FIRST STAGE.

SYMPTOMS.—The first stage of caries endures until the dental pulp or any portion of it has become gangrenous. The patient complains of severe intermittent pain, increased and induced by cold water, hot fluids, the sucking of air from the carious cavity by the tongue, and the pressure of food within it during mastication. Frequently the carious and aching tooth cannot be exactly indicated by the sufferer. Pain, as he says, flies round the teeth so that he hardly knows which is in fault. Careful examination with the aid of a mouth-mirror, and an excavator carrying a small dressing of absorbent wool, will usually reveal a cavity of moderate size in some tooth around which pain seems to centre. Our examination shows:—

1. The tooth is not discoloured.
2. Pain is not complained of when a moderate pressure is made upon a sound portion of its crown with a strong blunt pointed excavator, and the absence of such pain shows that the tissues outside and embracing its fangs are in a normal condition.

Guard, however, against being deceived by the starting and flinching in which nervous patients will indulge at the moment of contact of the excavator with the tooth. A

good plan is to test other teeth near the suspected and carious one *before* coming to the latter. 3. Most acute and darting pain is felt when the edge of the excavator is inserted into the decayed dentine in the floor of the cavity, or when the dressing of wool is wiped across its surface. Be it remembered that this should be very cautiously and gently conducted, the walls and floor of the cavity being stroked rather than cut with the instrument, since intense pain may readily be caused and the dental pulp, if not exposed by the progress of decay, may be thus accidentally laid bare. 4. The crucial test, to ascertain if the nerve be still alive and sensitive, *i.e.*, if the caries be still in its first stage, may now be applied. Inject from the nozzle of a small syringe three or four drops of cold water into the cavity in the tooth. This will cause severe though momentary pain, but before inflicting it the patient should be cautioned that what is about to be done will probably produce this result. These four conditions then; the absence of discolouration, the absence of tenderness on pressure upon the crown of the tooth, the sensitiveness of the decayed dentine, and the pain caused by injecting cold water, go to show that the nerve is alive and in a normal, though perhaps irritated condition, and that the first stage of caries still continues.*

TREATMENT.—*The cavity small and nerve not exposed, or exposed by only a small opening through the wall of the pulp cavity.* Carefully examine the bottom of the cavity to learn if the nerve be exposed, which, if such be the case, may be seen as a bleeding highly sensitive spot. If this be not evident, or if the point of exposure be very minute and the cavity

of small or moderate size and so situated in the tooth that a plug of wool if inserted will be retained, a temporary filling may be applied. Before doing this all irritating particles of food should be washed from the cavity by syringing with *warm* water, and its walls and floor should be dried by gentle wiping with a dressing of absorbent cotton-wool upon the end of an excavator. The filling may consist of Wool with Carbolic acid, Wool with Tincture of Mastic, or Gutta-percha. The first may be used if the walls of the cavity are very sensitive, if the nerve be exposed by a minute puncture, or if the tooth be aching at the time of treatment. It may remain in for a day or two and then be replaced by a similar dressing; after which, if tenderness be lessened, a wool and mastic, or gutta-percha filling, may be inserted. In applying the carbolic dressing the end of an excavator should be rotated within a small piece of cotton-wool held between the thumb and fingers. The wool is thus rolled into a compact plug, the end of which may be dipped into a phial containing wool already saturated with carbolic acid. Thus only a small quantity of the latter is absorbed by the dressing, and indeed a larger application is undesirable as it is apt to excoriate the gums and cheek. Care should be taken that the plug is not inserted with so much force as to cause pain by pressure upon a nerve possibly exposed; and sometimes when the application of carbolic acid fails to soothe an aching dental pulp relief may be readily obtained by the substitution for it of thymol or eucalyptin. The wool and mastic plug may be inserted when the cavity has only slight tenderness. In applying it, the end

of an excavator should be armed as before with a little cotton-wool, which may be dipped into a strong solution of gum mastic in alcohol, after which a little dry wool should be wrapped around the plug. This may be introduced into the cavity, which has previously been washed out and dried, and may be allowed to remain for a few days, after which it is apt to acquire an offensive odour and should be changed. The gutta-percha filling may be used under such conditions of the tooth and cavity as make a wool and mastic plug possible, and it is more durable and less absorbent of the fluids of the mouth than the last. Its durability will be greatly increased if, after washing and drying the cavity as before, a sharp excavator be carried round the walls of the cavity, removing the softened dentine until the underlying hard tooth structure is reached. In so doing care must be taken to cause but little pain, and not to expose the dental pulp. To avoid this last, operate only on the edges of the cavity, leaving untouched on its floor the carious tissue. The gutta-percha, having been warmed over a candle flame, should be inserted while soft, and while only so hot that it may be applied to the back of the operator's hand without causing any pain. If the cavity be dry while it is being filled, and if such a stopping be in contact all round with hard walls, it may endure for some years; but be it remembered that the durability of any stopping is proportionate to its faculty for excluding moisture. In this connection reference to gold, amalgam, and oxychloride fillings is purposely omitted, such materials having no value save in the hands of those trained to their use. The employment of temporary plugs has, however, been

treated of at some length, as such will often do good service in allaying toothache, and preventing for a considerable time its return, by their exclusion of food, cold air, and hot and cold fluids from the sensitive surface.

The cavity large and nerve exposed.—Under these circumstances it may be impracticable to retain a temporary filling in the tooth, either on account of its extreme sensitiveness and constant aching, or from the absence of such adjacent teeth, or overhanging walls to the cavity, as would prevent the plug from coming out during mastication. Usually under these conditions extraction is the best course to adopt, but the health of the patient or other causes may prohibit this. The employment of arsenic is then indicated and should be thus applied. Equal parts of yellow soap and arsenious acid are to be well worked into a bolus, of which a pellet, as large as the head of a good sized pin, should be carried on an excavator into the bottom of the washed and dried cavity, as near as possible to the point of exposure of the pulp. The pellet may be held *in situ* by a plug of wool, which should be removed after 24 hours and replaced with a wool and mastic filling. One application of arsenic generally suffices to devitalize a dental pulp, but sometimes a second and smaller piece may be introduced into the tooth after two or three days, if it be found still sensitive to cold water from the syringe. The pain caused by the action of arsenic on a pulp is generally severe for three hours and commences within half an hour of its application. After six hours the pain has generally quite departed, and the condition of the tooth so changed that the patient no longer dreads to inhale a

deep breath of cold air or to brush the teeth with cold water. Thus, at the expense of a temporary increase in such toothache as he may have already long suffered, may be gained complete relief, and the tooth, though its existence may not be prolonged, will no longer remain a constant source of pain. In applying arsenic guard against allowing the soft pellet to be squeezed out of the cavity, while the wool plug is being introduced, so that it is brought into contact with the surrounding gum. Thus much painful ulceration may be caused, and no beneficial action upon the aching dental pulp result. Guard also against using a pellet larger than the head of a good sized pin; and also avoid its use altogether if decay has so far advanced that both walls, or the floor of the pulp cavity, are perforated so that the caustic should exert its destructive influence upon the socket on the opposite side of the tooth.

CARIES IN ITS SECOND STAGE.

The second stage of dental caries has been reached when the dental pulp, or any portion of it, has become gangrenous, *i.e.*, dead and decomposing. Such a condition always results from decay when it is allowed to go on unchecked by natural or artificial means. A natural limitation of caries sometimes occurs when the disease in its progress reaches a substratum of solid, well-developed, non-absorbent dentine. Then we find the floor of the cavity composed of hard dark ivory, which shows no tendency to softening. The artificial means employed

to permanently arrest decay consist in excavating and filling the tooth with some imperishable material, or in cutting out the decayed tissue and carefully polishing the resulting surface.

As a consequence then of the advancing caries the pulp becomes irritated, aches, and at last takes on a process of destructive inflammation, by which after several hours of severe pain its vitality is destroyed. Or this last condition may be reached more gradually and without any attack of severe pain. Here it may be noted that the vitality of a dental pulp may depart without any pre-existent decay and as a result of a generally depressed condition of the health; or again it may be destroyed by a violent blow upon the tooth; also by the action of arsenious acid employed as before mentioned. The pulp having lost vitality will in a few weeks become putrescent, evolving the usual gaseous products of decomposition. The pulp cavity and the canals down each fang are now charged with a dark, viscid, fetid substance, from which gas is constantly escaping by any opening that may exist through the wall of the pulp cavity. This opening may be found at the bottom of the original cavity of decay, the result of the softening and destructive action of disease upon the dentine, or it may have been made artificially by the excavator of the operator. Such is the usual course of events:—the putrefaction of a dental pulp follows its death, unless, when arsenic has been used to induce this, a careful antiseptic treatment has been employed.


To achieve this, to destroy a pulp and to protect it subsequently from septic change, a minute attention to these

details is needed. The central cavity and the fang canals should be cleared three days after the application of arsenic of all devitalized organic filaments by inserting and withdrawing minutely barbed and antiseptically treated steel instruments.

FIG. 18.

The fang canals and central cavity should then be dried with absorbent wool, and should be filled with filaments of wool saturated with carbolic acid. These should be tightly compressed within the tooth and allowed to remain, while over them the permanent metal stopping is inserted. Thus the tooth may be made to last for many years, protected by the stopping from the advance of caries, and by the carbolised wool within it from the generation of products of decomposition; its vitality being sustained through the membrane covering the cementum of its fangs.

In the absence of such antiseptic measures, the death of the pulp, whether it come from the advance of caries, from depressed state of general health, from traumatic cause, or from arsenical action, induces putrefactive change within the pulp cavity. So long as the evolved gas can escape freely into the mouth no special symptoms, beyond a disagreeable odour of the breath, result. If, however, there be no such opening through the wall of the pulp cavity, or if one that has existed, or has been made, be plugged up by a particle of food, or by a filling of any kind



Nerve Extractor for removing devitalized dental nerve.

inserted by the operator, we find at once, or within a few hours, a special and characteristic set of symptoms induced. The septic gas now collects within the pulp cavity, where it is pent up unable readily to escape, and it may cause very severe toothache within half an hour of the plugging up of the hole if there be a small portion of the pulp still alive in one of the fangs.

To the pressure of such elastic vapor thus suddenly applied to a dental nerve of which the upper part was gangrenous while the lower half was alive and sensitive, and to no other cause, can I attribute the severe pain which I had an opportunity of observing within twenty minutes of the closure of an opening at the bottom of a carious cavity and leading into the pulp chamber from which a discharge was escaping from a semi-devitalized pulp. My opinion as to the mode in which pain was induced, and which always occurred within a short time of the aperture being blocked by particles of food, was confirmed when the tooth was subsequently removed, when on splitting it open the deeper lying parts of its nerve tissue were found to be perfectly healthy, those nearer the surface being gangrenous.

If, however, the pulp be entirely gangrenous throughout, the pressure of the pent up gas serves to force out some of the softened and decomposed nerve tissue through the openings at the fang extremities into the socket of the tooth. The extrusion of such septic particles into proximity with the healthy membrane lining the socket serves in most cases to induce more or less severe periodontitis, the cause of which, when it is localized around one tooth, is almost invariably such as has been indicated, and it is a

tooth producing this condition which is popularly said to have "caught a cold."

Periodontitis then is in almost all cases preceded by the death and putrefaction of the whole of the pulp and the extrusion of putrescent particles through the openings at the ends of the fangs. My own experience induces me quite to dissent from the views of those who hold that periodontitis may result from extension of inflammation from an inflamed pulp within a tooth to the healthy tissue outside its fangs, and, in support of my view, I may say that I have never yet met with periodontitis, attended with suppuration, around the fangs of teeth containing vital nerves. On opening into the pulp cavities of such teeth as were causing periodontitis, their pulps have always been found to be in a decomposed state, and it is not evident how inflammatory action can extend, as has been asserted, from a tissue which is itself already dead.

We find further evidence in support of the cause here assigned for the production of periodontitis, localised around one tooth, in the fact that the condition may be almost invariably relieved in a few hours by drilling through the walls of the pulp chamber, and so allowing the gas to escape into the mouth rather than through the fang ends. If the opening so made be accidentally or intentionally closed in the course of a day or two, the gas which collects within the pulp cavity will again force its way into the socket through the openings of the fangs, and thus acute periodontitis may be once more set up. It may be noted that the rheumatic diathesis, mercurial treatment, or a traumatic cause, may produce sub-acute inflammatory

change within the maxillary socket; but this may be distinguished from periodontitis arising from putrefactive change within a pulp cavity. The latter is at first localized beneath one tooth, which is tender to pressure, often much decayed, and with pus escaping around its neck if the inflammation in the neighbourhood of its fangs have proceeded to the production of an alveolar abscess.

Periodontitis thus caused by a process of putrescent inoculation may be acute or chronic.

Symptoms of Acute Periodontitis.—1. Dull, aching, continuous pain around a tooth which is usually much decayed. It must be noted, as has already been observed, that the pulp may die and decompose within a tooth that is in no way affected by caries; so the presence of a cavity is not invariable, and acute periodontitis may occur around the teeth of old persons, or of those in feeble health, or as a sequence to some injury that has devitalized a dental pulp. 2. The tooth is slightly raised from its socket and so stands above the level of its neighbours and to the patient feels “longer” than others. This comes from the swelling of the tissues inside the socket, whereby the conical fangs are slightly lifted out. From the same cause the tooth is rather loosened and may be rocked readily from side to side. 3. It is very tender on pressure and tapping, and this results from the communication of the force through the tooth to the highly sensitive and inflamed tissues around its fangs. In applying this test it is well to tap other teeth before the suspected one so that the element of nervousness may be excluded. 4. Our crucial test is to inject cold water with a syringe into the carious cavity,

which of course, as the nerve is quite dead, causes no pain. On cutting the decayed dentine very lightly with a sharp excavator there is also no pain produced, since there is no longer sensation in the tooth. If the instrument be used at all forcibly the patient will complain, but this comes from pressure of the tooth into its inflamed socket, and cannot be mistaken for the acute pain caused by cutting the dentine of a tooth affected by caries in its first stage.

5. Around the fangs and within the socket a collection of pus soon forms, which discharges around the neck of the tooth, and with the formation of this Alveolar Abscess, as it is termed, relief from pain is generally experienced.

The pain and inflammation may now subside, and the tooth may become fairly firm again, but while it remains in the mouth it is likely to cause again similar trouble, or to act as a source of chronic periodontitis.

Treatment of Acute Periodontitis.—As a rule it is best to extract the tooth causing the mischief; but relief may usually be given in an hour or two by opening into the pulp chamber through its walls at any part with an excavator or sharp drill. By so doing the imprisoned gas, generated of the putrefaction that is going on within the tooth, is permitted to escape freely into the mouth, and so is no longer compelled to leak from the fang ends. The opening should be free, and kept patent by a filling of dry cotton-wool, *loosely* inserted and changed daily. This treatment may be applied to such teeth as it may not be desirable to extract, and relief from pain may be almost certainly promised. The decayed temporary molars of children may be so treated (*vide ante* Chapter I.), also among adults we

may thus relieve inflammation around a tooth which may be valuable for appearance or mastication. Extraction, or opening into the pulp cavity, afford the only means of relieving acute periodontitis, and a slight consideration of the cause leading up to this condition will serve to convince of the absolute inutility of applying escharotics or counter-irritants to the gum overlying the affected part. A popular impression is apt to prevail as to the undesirability of extracting a tooth around the fang of which acute inflammatory action, or an alveolar abscess, is existing. This it may be said is quite erroneous. With the removal of the tooth that is the cause of the periodontitis, whether the latter be attended with the formation of matter or not, the pain and swelling in and around the alveolar structures will soon subside, and, if extraction be deemed desirable, the operation should be effected without any delay. Not infrequently a good deal of dull aching pain with a sense of tension and throbbing within the socket will follow the removal of the tooth. This may endure for two or three days unless relief be given by occasionally raising from the site of extraction with the point of an excavator the firm blood-clot beneath which sanguineo-purulent fluid is apt to collect and be pent up within the inflamed socket. This is a point of some importance and the patient, if unable to obtain medical assistance daily, should be instructed to perform the operation for himself, using for the purpose the point of a pair of scissors or the end of a sharpened quill.

Symptoms of Chronic Periodontitis.—The inflammatory action set up around the fangs may take a chronic form,

though the cause is the same whether the periodontitis be acute or chronic, and relief may be given by similar treatment in both cases. The gaseous products of decomposition from the interior of the tooth leaking through the fang ends, with the purulent secretion that forms around it within its socket, escape through a sinus which usually opens through the outer alveolar plate and the gum covering it. The orifice of such sinus is marked by a small papilla, or gum-boil as it is termed, from which pus may be often found escaping in small quantities. The gum-boil may at times be found on the palatine mucous membrane over the inner fang of an upper molar, but as a rule it is placed on the outer surface of the gum. This condition may endure for several years, the gum-boil alternately coming and going, and the tooth slightly loosened in its socket and occasionally tender on pressure. An alteration in the colour of a tooth containing a decomposed pulp is generally evident in the course of a few weeks from the time at which the latter became devitalized. The coffee-coloured fluid within the pulp chamber fills the dentinal tubules, stains the dentine, and its dark tint is apparent through the semi-translucent enamel. If then any tooth in the neighbourhood of which there is a gum-boil, and which is a little loose, and occasionally rather tender, shows on examination by daylight a darker tint than its neighbours we may safely conclude that its contained pulp is decomposed, and that a condition of chronic periodontitis is established around its fangs. In such a condition we often find a tooth containing a large stopping under which the pulp has died and decomposed, or in which the pulp

at the time of stopping was devitalized by the operator with the aid of arsenic. It should be noted, however, that if such antiseptic precautions as have already been mentioned be taken after the use of the latter there is but little fear that putrefactive changes within the tooth, and chronic periodontitis around its fangs, will be the sequel to its stopping. Such a mishap may generally be attributed to the neglect of such precautions, or to the imperfect manner in which they have been carried out. It is not unusual to find a tooth, which has for some years caused in the manner described a slight irritation within its socket and a gum-boil over its fang-ends, becoming eventually quiet and ceasing to trouble by the generation and extrusion of putrefactive products from its interior. Frequently, however, such teeth become gradually loosened and are shed, or by their becoming a source of pain their extraction is necessitated. Then their fangs are found to be rough and partly eroded towards their extremities, around which also are adherent shreds of fibrous exudation.

Treatment of Chronic Periodontitis.—Chronic periodontitis, whether it be caused by a carious tooth; by a tooth sound as regards decay; or by a tooth in which a stopping has been inserted, may be relieved by drilling or excavating an opening through the walls of the pulp chamber, or through the stopping as the case may be. Such a hole may be minute, and may be drilled through the outer side of its fang on a level with the edge of the gum, an operation to which the name of *rhizodontrophy* has been given. Thus a vent is afforded to the imprisoned gas, the irritation within the socket is usually allayed, and the gum-boil disappears

and is absent so long as the opening into the pulp chamber remains patent. By a careful introduction of carbolic acid or Condyl's fluid into the fangs, if access can be obtained thereto, the putrefactive change may be partially arrested; but such an operation can at the best be only imperfectly performed, and the dentinal tubules, charged as they are with fetid organic matter, remain inaccessible to the agents and instruments of the operator. If the pulp has but recently died and decomposed these measures should be adopted and have great value, but if the staining of the tooth shows that the septic change is of long standing they cannot be expected to prevent further putrefactive change within the tooth. Care should be taken when introducing Condyl's fluid on the dressing of wool into a fetid fang lest any decomposed organic matter be driven before the piston through the opening at the fang end. Such a mishap has frequently resulted in the treatment, which was designed to relieve chronic periodontitis, becoming in itself a cause of acute inflammatory action within the socket.

CARIES IN ITS THIRD STAGE.

If decay advance unchecked the crown of the tooth disappears, leaving sharp spiculæ of enamel that are apt, unless filed down, to excoriate the cheek or tongue. With the disappearance of the crown decay may be said to have reached its third stage, and nought now remains of the tooth save the fangs, the dentine of which has become carious and softened, and which contain the debris of dead and decomposed nerve tissue. Such stumps may remain

for years without causing any trouble, but frequently they set up a condition of chronic inflammation, as the result of which they may become rough and eroded and more or less enlarged or *exostosed*, as it is termed. Moreover, by an exudation around them of inflammatory lymph, they may be glued into their sockets so tightly that their extraction becomes at times no easy task. The difficulties met with in the removal of such stumps arise from three causes: 1. the glueing of the fang into its socket which prevents the ready introduction of the blades of the forceps; 2. the hollowed condition of the interior of the fang which induces its walls to collapse as soon as the instrument is forcibly closed upon it; 3. the exostosed condition of its surface, which is often caused by chronic periodontitis, and by which it is firmly rivetted, as it were, into the maxilla. Pain, when it is caused by decaying stumps, is of a neuralgic nature, not located around its exciting cause, but intermittent and flying over the side of the face and head, and it is increased by hunger, fatigue, or other depressing cause. As to the propriety of removing such fangs there can be no question. With their removal the neuralgic trouble will vanish, and it may be confidently stated that facial neuralgia has almost invariably a dental cause. Stumps, if quiet, may be disregarded, since they may be of a certain use in masticating food; but, if it be thought desirable that artificial teeth should be worn, it is generally well to extract all such stumps as are causing any local or nervous irritation before taking the models to which the frames are to be constructed.

It should be noted that chronic inflammatory action or

irritation, when produced by any of the six lower molars or their fangs, is apt to prove the cause of the two following well marked conditions, which, though they may be caused by other teeth, are not often associated with disease of any but the lower molars.

1. *Closure of the jaws.*—This rarely results from irritation save that which is caused by a second or third lower molar, and more often comes from the latter than the former tooth. Inflammatory exudation, slowly organized into fibrous bands, may have slowly formed around the temporo-maxillary articulation on the affected side, and by its gradual contraction may have so reduced the opening into the mouth between the incisor teeth that the introduction of solid food may have become almost impossible. Under these circumstances the patient should be well anæsthetised and the mouth forcibly opened with the aid of a powerful screw gag (*vide* fig. 30) placed between the bicuspid teeth. Pressure should bear upon these rather than upon the incisors, since the latter may be broken or dislocated by the required force. The ligamentous adhesions around the articulation being thus stretched, the dental cause of the mischief may be searched for, and should be entirely removed. For the after treatment of such cases a daily separation of the teeth should be gently and gradually effected with the aid of the screw gag, and will serve to restore in a week or two the original mobility of the jaw.

2. *Fistulous opening through the cheek.*—This rarely proceeds from any but the lower molars, and of these the first molar is more apt than the second or third to prove the cause. It may be apprehended when the cheek over-

lying the seat of periodontitis, whether this be acute or chronic, is found to become glazed, reddened, and adherent to subjacent structures. No time should then be lost in extracting the tooth or stumps that appear to be causing mischief, and thus by timely action the disfigurement may be averted. The fistulous opening when once established may remain for years a channel through which purulent fluid, secreted around the diseased fangs, occasionally escapes. After a time the discharge may cease by natural causes; but the extraction of the stump, which being usually glued into its socket is sometimes difficult of removal, will at once cure the condition, if it be not so far advanced that necrosis of a portion of maxilla has been induced. If this last exist the healing must of course be delayed until the dead structure has been thrown off or removed, but always an unsightly pucker in the face will mark the site of the old fistulous opening.

CHAPTER VI.

TOOTHACHE.

ODONTALGIA, PERIODONTITIS, GAS PRESSURE ON THE NERVE,
NEURALGIA.

Pain in or around a tooth is, as a rule, one of the attendants upon its decay at some stage of the disease, and usually takes one of the following forms.

I. *Odontalgia*, or the pain that accompanies the first stage of decay (*see* Chap. V). This varies in severity, is intermittent, and at times comes on in sharp paroxysms. It is located usually in the aching tooth, but, if a lower wisdom tooth be affected, it may fly up into the neighbourhood of the ear. It is increased and induced by hot and cold fluids, cold air, pungent or sweet food, and pressure of particles into the carious cavity during mastication; while, as its cause, is always to be found some tooth of which the crown is more or less damaged by decay or mechanical violence, and of which the dental pulp is in a vital, highly sensitive, and irritated condition.

The treatment of odontalgia must vary with the local condition producing it. If decay be not far advanced, and the nerve not exposed, or exposed by only a small aperture, the cavity should be syringed out with warm water, and should be plugged with a dressing of wool and carbolic acid (*see* Chap. V). Thus the irritated pulp is soothed,

and protected by a non-conductor of heat from thermic and other influences. The wool may be changed daily, or may be replaced in a few days by a filling of gutta-percha. Should the cavity be large and the pulp freely exposed it will probably be necessary to destroy the latter with the aid of arsenic (*see* Chap. V), or to extract the tooth.

II. *That which attends Acute Periodontitis.*—Such pain is *constant*, as distinguished from the *intermittent* pain of odontalgia. It is at first dull, but becomes more severe as the inflammation increases, and endures often until a discharge of pus takes place, which wells up around the neck of the tooth from the alveolar abscess that may have formed within the socket around its fangs. With the formation of matter a sensation of throbbing is experienced within the maxilla, and considerable swelling of the soft parts around the seat of mischief is then noticeable. The tooth becomes very tender to pressure or gentle tapping, is raised from its socket, and so loosened that its crown may at times be readily moved laterally to and fro, but it is not sensitive to hot or cold fluids. Its pulp cavity and fang canals contain *always* dead and decomposed nerve tissue, from which septic particles have been extruded into the alveolar sockets through the orifices at the ends of the fangs by expansion of gaseous products of putrefaction pent up within the pulp cavity (*see* Chap. V). A tooth thus circumstanced is usually found to be much decayed, but, as before mentioned, periodontitis may be induced by the action of one in which the pulp has lost its vitality from causes other than caries, as from a blow, or from general ill-health. To relieve the pain of periodontitis

the pulp cavity should be opened with a drill or an excavator, so that the pent up gas may escape, or, if the mischief be far advanced, the tooth should be extracted. The latter operation, as before said, may be performed at any stage of the disease; indeed, the more severe the inflammatory action may be, the more needful it becomes to extract the tooth.

III. *That caused by gas pressure upon a sensitive portion of a dental pulp.*—Such pain is most intense, constant, of several hours in duration, and located strictly within the affected tooth. This will be found to contain *semi-gangrenous* nerve tissue; that portion of the latter situated within the fang canals being still vital and sensitive, while that occupying the pulp chamber has lost vitality, is gangrenous and evolving gaseous products of putrefaction. These, pent up within the sealed pulp chamber, unable to discharge themselves into the mouth, produce by their increasing pressure on the nerve filaments still retaining sensibility the intense pain that accompanies this condition, which may endure until the vitality of the whole of the nerve has been destroyed. The tooth thus affected is sensitive to neither heat nor cold, since its nerve is partially dead; nor is it tender on tapping, since as yet no periodontitis exists within its socket. Relief may be instantaneously afforded by opening with drill or excavator into the pulp chamber, through the floor of the carious cavity which generally exists, and by so doing the gaseous tension within the tooth is at once relieved. The opening should be kept patent by a plug of cotton wool, *loosely* inserted and changed daily. From what has been already said it may

readily be understood that the death, and subsequent putrefaction of the *whole* of the dental pulp thus brought about may, in the course of a few weeks, produce a condition of periodontitis within the alveolar socket.

IV. *Alveolar and Facial Neuralgia*.—This is variable in degree, becoming more severe when the general health is disturbed, and after bodily fatigue and want of food. It flies up the side of the face, into the neighbourhood of the ear, or downwards towards the shoulder and arm. There may in almost all cases be found the stumps of decayed teeth, which should be completely removed if the neuralgic symptoms are persistent, and it may be noted that most cases of what is termed *face-ague* and *tic douloureux* have, as their exciting cause, a dental condition such as that described.

The four preceding conditions are those usually accompanying pain in and around the dental structures, and such admits of ready relief if its cause be recognised and the appropriate remedy adopted.

CHAPTER VII.

MECHANICAL INJURIES TO THE TEETH.

WEARING DOWN OF THE TEETH FROM FRICTION OF MASTICATION. HUNTER'S DENUDING PROCESS. FRACTURE AND DISLOCATION OF A TOOTH FROM VIOLENCE.

TOWARDS middle life the cutting edges of incisors, and the grinding surfaces of the masticating teeth, show signs of wearing down, and the rapidity of such action is dependent upon the density of the tooth structure, and upon the nature of the food. Among savage races, who live mostly on coarse badly prepared materials, we see such extensive attrition that the pulp cavities would be speedily opened into, did not a development of secondary dentine within the pulp cavity and adherent to its walls prevent such a result.

It is also not unusual to find among middle aged persons a deep horizontal well polished groove, reaching almost into the pulp chamber, across the outer surfaces of the necks of incisor, canine, and bicuspid teeth. This condition, to which the name of *Hunter's denuding process* has been applied, results from the friction of the tooth-brush acting upon the softer cementum of the neck of the tooth which has become exposed by the commencing recession of the gums. From this last cause the necks of

the teeth are towards middle life frequently laid bare, and their less durable structures are liable to be thus damaged by a mechanical cause, aided by the solvent action of the fluid of the mouth.

The surface tenderness which is often associated with this action may be relieved by a frequent application of eau de Cologne upon wool; but if there be a deep cup-shaped cavity in the grinding surface of a molar, or a groove upon the neck of an incisor opening almost into its pulp-chamber, it may become necessary to insert a metal filling in order to prevent further and more serious damage to the tooth. Moreover, all rapidly cutting tooth-powders, such as charcoal or pumice powder, should be at once discontinued, and a soft brush be used with soap and chalk. These last only should indeed be employed in all cases, and if used twice daily will be quite effective in keeping the teeth well polished.

One or more teeth may be fractured by a blow acting directly upon the damaged organs, or indirectly through the sudden closure of the lower teeth upon the upper, as when a heavy fall is sustained upon the chin in the hunting field. The rough fractured surface may be smoothed down with a fine file if the damage be but slight, and surface tenderness may be relieved by an application of eau de Cologne or nitrate of silver. If the pulp cavity be broken into it may be necessary to destroy the nerve with arsenic, and subsequently to fill the tooth or to file it down to a level with the gum; or to extract its fang preparatory to the insertion of a plate carrying an artificial tooth.

An incisor tooth may be partly or entirely dislocated by violence. It is well in such cases to replace it and by a careful moulding of gutta-percha, softened in warm water, around it and its neighbours, to retain it *in situ*, in the hope that it may again become firm in its socket. This it will very frequently do, but the violence to which it has been subjected generally destroys its dental-pulp, which by subsequent decomposition is liable to induce periodontitis in the course of a few months. For this last the remedy, as before pointed out, is to drill a small opening through the neck of the tooth into its pulp chamber (*see* Chap. V., *rhizodontrophy*).

CHAPTER VIII.

EXTRACTION OF TEETH AND STUMPS.

CONDITIONS NECESSITATING EXTRACTION. GENERAL DIRECTIONS AS TO THE POSITION OF OPERATOR AND PATIENT. CONCERNING THE APPLICATION OF FORCEPS. AS TO THE EXTRACTION OF THE TOOTH. ACCIDENTS DURING EXTRACTION. A LIST OF INSTRUMENTS NEEDED FOR EXTRACTION. FORCEPS, THEIR GENERAL CHARACTERS AND VARIOUS FORMS. THE ELEVATOR, ITS DESCRIPTION AND MODE OF USING. THE SCREW EXTRACTOR.

ATTENTION to some practical points in connection with this subject is necessary to the medical practitioner, who, though his dental practice should have a wider range, is likely to be more often called upon to use the forceps than to perform other dental operations. He may be required to relieve irregularity and overcrowding among the permanent teeth of his young patients by the judicious removal of one or more dental organs. He may find extraction to be the only means by which he can cure the toothache for which his patient has consulted him, and he will be called upon to adopt this treatment when, from the necessities of the case, immediate relief from severe pain is urgently demanded. This last may be required

when extensive caries, or fracture from direct or indirect violence, has laid bare an aching dental pulp; or when acute periodontitis is producing alveolar abscess. He will find it absolutely necessary to extract a diseased lower wisdom tooth which is causing closure of the jaws through the contraction and rigidity it may have induced around a temporo-maxillary articulation. Moreover, to cure a fistulous opening through the cheek, or to prevent its occurrence when threatened, nothing will suffice but the complete removal of the lower molar which he will probably discover to be the cause of mischief. He may be required to take out a loose temporary tooth the fangs of which, sharpened by partial absorption, are ulcerating through the gum and excoriating the cheek or lip; extraction may be needed by a decayed lower molar whose ragged edges are threatening to produce malignant disease of the tongue; or for the cure of epulis some decayed stump, underlying the tumour, may need removal. As the teeth become loosened by the absorption of alveolar process and recession of gums that accompany other senile changes, extraction will from time to time be required to prevent them from proving a hindrance to mastication.

The foregoing are the most frequent conditions under which the use of forceps is indicated, though doubtless from time to time their employment will be required from other causes. To apply them effectively it is necessary to place the patient in a solidly made chair with the back sufficiently low and so cushioned that, if the removal of an upper tooth be required, the head may be readily thrown back and supported. The head and hand of the operator should

never be allowed to intercept the light which should fall directly upon the tooth. When an upper tooth on either side is to be extracted, he should stand with feet well separated by the *right hand* of his patient; he should stand immediately *behind* the latter and leaning over his head when about to take out a lower tooth on the right side; and when extracting any lower tooth on the left side the operator should place himself by the *left side* of his patient. The attitude of the operator should be easy and unconstrained, so that his power may be exerted to the best advantage. With this in view the operating arm should be held fairly close to the side that its movements may be well regulated and under control; the head of the patient raised or lowered; the chin thrown upwards or depressed; and the head always so turned towards the operator that his forceps may have easy access to the tooth. If it be an upper tooth that is to be extracted his left hand must be used to steady the upper maxilla during application of the forceps, and to aid the extraction by providing an opposing force to the traction of the instrument. To effect this he should firmly grasp with fingers and thumb the alveolar process on either side of the tooth he is about to remove. If the tooth be in the lower jaw the left hand should be used to prevent all rocking and depression of the inferior maxilla by rigidly securing it between the fingers and thumb.

In applying forceps to a tooth with a view to its extraction the operator should determine to insert their blades as deeply into the socket and as far up the fang as is practicable. An exception to this holds good when the removal of

a temporary molar is demanded, since the crown of the underlying permanent bicuspid may be grasped by the instrument if this be used too vigorously. In the *application* of forceps these points should be regarded. 1. The tooth should be grasped very lightly between the blades of the instrument in order that the latter may travel freely up its fang. 2. The forceps should be pushed freely and vigorously home. 3. During this process the instrument should receive the slightest possible rotation on its long axis. This should hardly amount to more than a tremulous movement, but it suffices to convince the operator that the blades are not gripping the neck of the tooth so tightly as to prevent them from travelling up it. 4. The long axis of the blades of the forceps should be continuous with or in the same direction as the long axis of the tooth. If this be disregarded the margin of the blades may impinge upon a neighbouring tooth, which by its resistance may greatly hamper the operator while performing extraction. This precaution is very necessary when an upper bicuspid has to be removed. 5. The eye of the operator should be fixed upon the tooth and it should never be lost sight of throughout the operation.

The neck of the tooth being thus securely and firmly grasped, *extraction* should be effected by steady and continuous traction. Combined with this should be partial rotation on its long axis, if it be a single fanged tooth, as an upper or lower incisor, canine, or bicuspid, with also a *slight* amount of rocking or lateral movement applied judiciously and with great caution. Be it born in mind that the risk of breaking a single fanged tooth is greatly increased when this rocking movement is applied, but in some cases it is quite

necessary to adopt a certain amount of it. If it be an upper or lower molar, the tooth should be freely rocked inwards and outwards while forcible traction is being employed, and with such teeth any rotation upon the long axis is of course prohibited by the arrangement of their fangs.

There are certain untoward occurrences, by no means uncommon in tooth extraction, which must be noted as follows.

A. The tooth to which forceps are applied may break. This accident usually results from one of the following causes.

1. The long continued progress of decay may have almost entirely softened the dentine of which its fangs are composed. Added to this may be the glueing of their exteriors into their sockets by inflammatory exudation before referred to (*see* Chap. V.) These conditions prevent the blades of forceps from travelling down, and favour the collapsing of the walls of the stumps as soon as pressure is brought to bear upon them. In such cases it is well to commence by using the elevator to partially dislodge them, and the forceps may then complete their removal. In this state do we often find a carious lower molar with which a fistulous opening through the face is connected.
2. The fangs may be considerably curved and clinging tenaciously to septa of bone or to fangs of neighbouring teeth.
3. The fangs may have, as the result of chronic inflammatory action, become enlarged or exostosed, and so rivetted into the alveolar process.
4. The dentine may have as the result of senile changes become almost as brittle as glass, and on this account it is well to be on one's guard when dealing with the teeth of

elderly persons. From any of these causes a tooth or stump may break, and blame in many cases is not to be attributed to the operator if it do so. He should always, before applying his forceps, ascertain the mobility of the tooth in its socket by rocking it carefully and slightly to and fro with a strong excavator resting against the inner or outer wall of its crown. If fracture occur during extraction, he should wipe away with a plug of absorbent wool on the end of an excavator any blood which may conceal the surface of the stump, and then attempt its removal with a finer or narrower instrument. If he now fail after a reasonable attempt, let him desist, since a prolonged operation serves but to exhaust his patient, and prevents his own success in any subsequent operation he may enter upon. If, as the result of the fracture, there be apparent a vital and intensely sensitive exposed dental pulp, this may be removed as completely as possible by passing down the fang a finely barbed nerve extractor (*vide* fig. 18, Chap. V). The stump, if it cannot be removed, may be allowed to remain with the probability that it will now give no more trouble, since the nerve which was previously aching has been removed, and being healthy and free from septic change it is not likely to set up periodontitis. If the motive for the attempted extraction be the relief of periodontitis, this condition will be relieved by the complete opening of the fang canals and the free escape thus given to imprisoned gas by the breaking off of the crown of the tooth. The patient may be further consoled by an assurance that after a year or two the progress of absorption both of fang and alveolar process will

probably render the removal of the broken stump comparatively easy.

B. While extracting a lower molar an upper incisor may be broken by the back of the forceps. This results from the sudden parting of the tooth from its socket after a prolonged effort has somewhat exhausted the muscular power of the operator. Guard against this by keeping the operating arm well under control, and by intently watching for the moment when the tooth is about to sever connection with its socket.

C. A tooth may be taken out other than that which it was designed to extract. This can result only from want of care; and should be guarded against by closely watching the forceps and the tooth they are enclosing throughout the whole operation. During hurried extractions under nitrous oxide this misfortune is liable to occur, when the instrument is applied within a moment of the removal of the face-piece by an operator whose haste and nervousness may prevent him from duly observing the parts with which he is dealing.

D. The alveolar process may be fractured, and indeed it is very common to find a small fragment of the outer alveolar plate adherent to the fangs of a molar after it has been removed. More than this has not happened within my experience, but a separation of the intermaxillary bone from the superior maxilla during removal of an upper incisor, and of transverse fracture of the ramus of the lower jaw while a lower tooth was being extracted, have been recorded by Mr. Salter. The accidents occurred in both cases to operators who possessed such skill and knowledge as to

make it certain the like may in some conditions be inevitable. Apart from this, however, must be regarded the breaking off of the tuberosity of the upper maxilla during the use of an elevator for removal of an upper wisdom tooth. For extraction of this last, forceps should be used, and the powerful leverage afforded by the former instrument served in a case that came under my notice a few years since to break away, with the upper third molar which was extracted, a mass of spongy bone in size as large as a walnut.

E. The gum may be lacerated during removal of a lower second, or third molar, through its occasionally strong adhesion to the neck of the tooth. If this be the case a scalpel should be used to divide it before the molar is entirely withdrawn from its socket.

F. The tongue or cheek may be punctured, and a large blood vessel thus opened, by the slipping of an elevator. The firm pressure of the end of the first finger of the operating hand upon the blade within one quarter of an inch of its extremity, at the moment of introduction, and then, as it is being thrust into the alveolus, upon the tooth to be taken out, or upon its fulcrum, will suffice to prevent this mishap.

G. The extracted tooth or stump may slip from the grasp of the instrument and passing into the trachea may cause much trouble. This is an accident which those operating upon an anæsthetised patient should guard against by carefully folding a mouth-napkin within the mouth behind the teeth or stumps that are about to be removed.

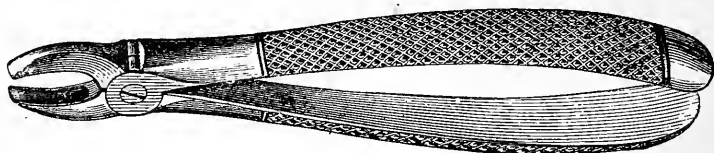
H. Persistent hæmorrhage after extraction, or coming on within a few hours of the operation, may need prompt attention. The firm blood clot which may often be found concealing the bleeding socket and its neighbouring teeth should be vigorously wiped away with a plug of wool on an excavator; a strip of dry lint, $\frac{1}{4}$ of an inch wide and about 6 inches long, should then be plugged into the socket, being condensed tightly and carried down completely to its bottom, with the aid of the excavator. Over the plug should be applied a compress of lint, and on this the jaws should be kept tightly closed for a few hours. In this way the bleeding may with certainty be controlled, and though the compress may be changed daily, the plug within the socket should remain undisturbed for three or four days. In arresting hæmorrhage under these circumstances dry lint will be found more effective than that moistened with any fluid styptic, such as Tinct. Ferri Perchlor.

A complete equipment of instruments for extraction should include eight forceps, one elevator, and one screw extractor and drill for the latter, and with less than these a practitioner will hardly be enabled to deal with all cases presenting for treatment.

The eight forceps should have these characters. Their handles should be strong, unyielding, and quite without spring, which tends to prevent an operator from judging accurately of the amount of pressure he is applying to a tooth. Their joints should be strong, and without any play, which, if it occur after considerable use, should be remedied by careful tightening up of the central rivetted screw. A loose joint causes much inconvenience during extraction, and

while wrenching the fangs from their sockets, since it allows the blades to slide to and fro over the sides of the tooth. Care should be taken that water, when cleansing the forceps, does not enter its joint, and the latter should be occasionally oiled that it may work freely and without any rigidity. The blades should be well tempered, being neither so soft as to bend or splay out at their edges, nor so hard as to chip or fly. Also the space between them, towards the joint, should be wide enough to enable them to close firmly upon the neck of a tooth without coming in contact with its crown. The stock of forceps should consist of the following.

FIG. 19.

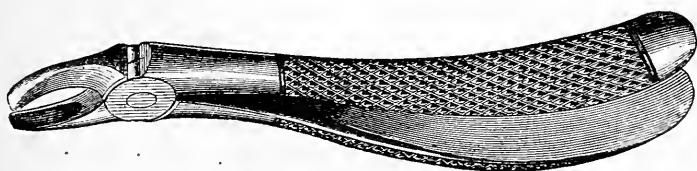


Upper incisor and canine forceps.

One pair of upper incisor and canine forceps. It will be seen that the long axis of the handles of these is not quite continuous in the same line, but is set at a slight angle with the long axis of their blades. In applying them to an upper front tooth they should be so placed that their handles incline towards the patient's chin rather than from it. To summarize the directions before given, remember in their application to force them well up the neck of the tooth. Ensure this by grasping the latter lightly, regulating the pressure by firmly pressing the ball of the thumb of the operating hand into the space between

the handles. Also while forcing them up within the socket give them a slight tremulous movement, or one of partial rotation upon their long axis, amounting to about $\frac{1}{32}$ of a circle, so that the sharp cutting edges of their blades shall sever the membranous connections between the fang and its socket. Extraction will be performed by steady continuous traction, increasing gradually in amount, during which the fang, being firmly and cautiously grasped, may be slightly rotated on its long axis. Any rocking movement, to and fro, or in an antero-posterior direction, is, as before mentioned, here injudicious. Efforts in this direction should at any rate be applied with much circumspection and only when traction with rotation does not promise to produce the desired result. The operation should not be hurried, and if the fang show signs of giving way the grasp of the instrument should be relaxed and it should be thrust more deeply into the socket. What is applicable to these forceps may be held to apply equally to those intended for the removal of lower front teeth and of upper and lower bicuspid.

FIG. 20.

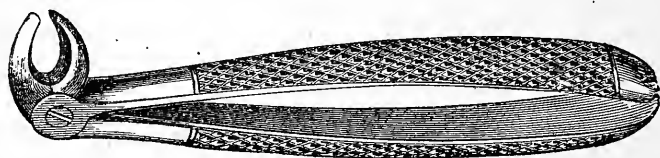


Upper bicuspid forceps for either side.

One pair of upper bicuspid forceps for either side. The use of these should be confined to the extraction of upper

bicuspid teeth, of entirely detached molar fangs, and occasionally of upper wisdom teeth. They should never be employed for the removal of badly decayed upper first or second molars, whose fangs are still united.

FIG. 21.



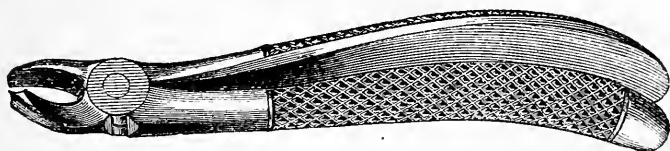
Forceps for lower incisors, canines and bicuspids.

One pair of forceps for lower incisors, canines and bicuspids. These are of much service also in the extraction of greatly decayed lower molars, which threaten to be fractured if grasped by the ordinary lower molar forceps. With the former, one fang, usually the anterior, may be grasped deeply in the alveolus and removed separately; or, as often happens, with the posterior fang attached to it. It should be noted that the second permanent or twelve year old molars are more rigidly fixed in the maxillæ than are the first or six year old molars. It follows therefore that the former, when greatly decayed, are more liable than the latter to fracture when the ordinary molar or double forceps (to be spoken of later on) are applied to them. For extraction therefore of second permanent molars, the lower bicuspid, or, as they are sometimes termed, stump forceps, are of considerable value. When one fang has been de-

tached and removed, but little difficulty will usually be encountered in taking out also the remaining fang.

One pair of forceps for upper right molars. The tang projecting from one blade is inserted between the two outer fangs, and the neck of the tooth being rigidly grasped,

FIG. 22.

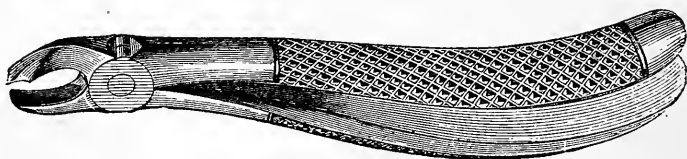


Forceps for upper right molars.

well within the socket, should be steadily rocked inwards and outwards while forcible traction is being exercised. No movement of rotation is admissible during extraction of upper and lower molars, owing to the arrangement of their fangs. An upper wisdom tooth, if not too firmly rooted, may be readily removed by upper molar, or stout bicuspid forceps. If it be very rigid and unyielding, it is well to commence by moving it *slightly* in its socket with the aid of an elevator, which should be thrust in between it and the second molar. The use of the elevator in this situation requires considerable care, owing to the liability thus encountered of breaking away the tuberosity of the superior maxilla, and the extraction of the tooth is to be completed with the forceps.

One pair of forceps for upper left molars. The tang projecting from one blade is inserted between the two outer fangs.

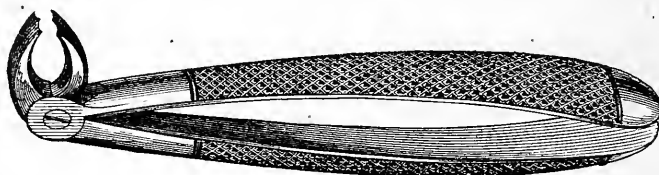
FIG. 23.



Forceps for upper left molars.

One pair of lower molar forceps for either side of the mouth. Each blade presents a projecting tang which should be inserted between the two fangs of the tooth. If the latter

FIG. 24.



Lower molar forceps for either side of the mouth.

be fairly solid and resisting these should be used in preference to the lower stump, or single fang forceps, since they afford a more secure and complete grasp of the tooth. As the long axis of lower molar teeth is frequently directed upwards and somewhat inwards, the operator should guard against depressing the handle of the forceps too

freely, by doing which he may at any time readily break off the crown of the tooth. If the lower molar be at all tilted inwards, he should aim at lifting it upwards and inwards at the time he is engaged in rocking it freely inwards and but slightly outwards.

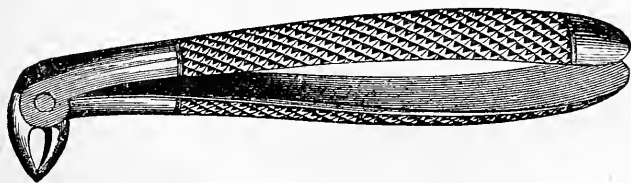
FIG. 25.



Upper stump forceps.

One pair of upper stump forceps. These are of use when searching for deeply buried single fangs, and being of somewhat delicate construction should not be too severely taxed.

FIG. 26.



Lower stump forceps.

One pair of lower stump forceps. These resemble those in fig. 21. Their blades, however, are somewhat longer, are more delicate, and close more completely at their cutting edges.

The *Elevator* should be strong and unyielding. Its length, inclusive of handle and blade, should be from five to six inches. The handle should possess a smooth broad

end, that the palm of the hand may not be injured when using it forcibly. The blade should be two inches long; and, for its lower inch, it should be flat on one side, convex on the other, and one quarter of an inch wide. Its extremity should possess a sharp cutting edge, and be neither pointed nor flat, but gently rounded. All spear and spoon shaped elevators are to be avoided; also, the instrument should be straight throughout, without curve or bend of any nature.

The elevator is of great value for extraction of lower wisdom teeth and of firmly implanted stumps. It can be employed only when there is a vacant space, or portion of maxilla free from any stump or tooth, immediately adjacent to the tooth for removal of which it is to be used; and for extraction of upper wisdom teeth it is rarely to be used, owing to the liability of fracturing the tuberosity of the upper maxilla. It should be inserted forcibly into the alveolus, alongside and in front of the tooth on which it is to operate, with its flat face adjacent to the latter, and its convex side in contact with the fulcrum. Its point should be directed during insertion downwards and inwards, so that the long axis of the instrument is about half way between the horizontal and the perpendicular. The elevator can be used effectively only if there be some strong, firmly implanted tooth, against which it can rest, as on a fulcrum; and if it be remembered that the elevator is used only as a lever of the first order, the need for this rigidity in its fulcrum must be apparent, since the pressure bearing upon the latter will be the sum of the force applied by the operator's hand, and of the resistance offered by

the tooth which is being extracted. Usually it will be found needful that the fulcrum should be in front of the tooth that is to be taken out, but this can hardly be laid down as a rule.

FIG. 27.

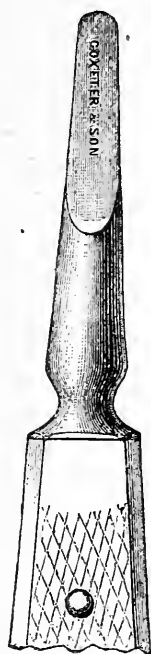


FIG. 28.



Diagrams of Elevator—front and side views. The blade being the exact size, the handle should be four inches long.

During the insertion of the blade into the alveolus, the end of the first finger of the operating hand must be pressed firmly upon it, within half an inch of its end, and also upon the side of the fulcrum, or of the tooth to be extracted. Thus any puncturing of the tongue or cheek may be quite prevented in the event of a slip, a by-no-means unusual event,

since the force needed to insert the instrument is frequently very great. After the insertion of the blade its handle should be carried forward towards the median line. At the same time the instrument should be slightly rotated on its long axis, so that the lower edge of its blade may tend to lift up and loosen the stump from its socket. During these operations the eye should be fixed intently upon the fulcrum, which may, if care be not taken, readily start from its position. Thus used, the elevator serves to raise and slightly detach a tooth, but for the completion of its extraction, which is thus rendered an easy task, the forceps may be required. For the removal of *lower* wisdom

FIG. 29.



Diagram of a screw extractor for removal of stumps of upper incisors and canines.

teeth the elevator is very serviceable, and it should then be thrust freely into the alveolar process between the second and third molars.

The *Screw Extractor* is of use for removal of decayed stumps of upper incisors or canines. The fangs generally need to be opened up with a conical four-sided drill, passed up the fang canal, and rotated between the finger and thumb; after which the instrument may be carefully screwed into the fang, which should be removed by gentle traction and rocking.

CHAPTER IX.

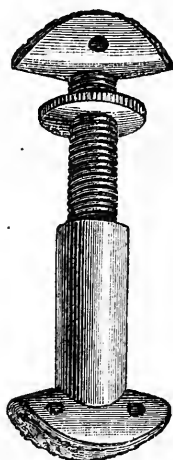
ANÆSTHETICS. PREPARATION OF THE MOUTH
FOR FRAMES. SALIVARY CALCULUS.

NITROUS OXIDE, Chloroform, and Ether are employed to prevent pain during extractions. Inasmuch also as they lessen the shock of an operation they are beneficial when dealing with children and those whose health is enfeebled.

Nitrous oxide is now supplied in a liquid form, condensed by pressure and cold into strong wrought iron bottles, whence it is liberated into the bag from which it is to be inhaled. It is an anæsthetic well suited for minor extractions, and may safely be re-inspired when a second or third tooth has to be removed. It may be applied to patients of all ages, but is very suitable for young healthy persons fairly free from nervousness. It has great value when anæsthesia is needed by one whose heart is enfeebled from age or ill-health, and then should be greatly preferred to chloroform, since it acts as a stimulant to the weak organ, while the latter tends to depress its action. Nervous, hysterical girls, will frequently not take "gas" well, and for such chloroform should be used, and will usually be found quite safe and efficient. A *sine qua non* in the employment of nitrous oxide is a free and full expansion of the chest during inspiration, and this the highly strung nervous patient is frequently quite unable to effect. It

may be breathed until blueness of the face and commencing stertor indicate that the right degree of insensibility has been attained. This, if the mask fit so accurately that no air be introduced with the inhaled gas, is usually arrived at within 50 to 80 seconds from the commencement of inhalation. The extraction should of course be performed as rapidly as possible after withdrawing the mask, and great care needs then to be taken lest the tooth slip from the grasp of the forceps down the trachea of the patient, and lest a like accident occur with the gag or prop that has been used to keep the jaws apart. To prevent the latter a short piece of thin twine should always be attached to the gag, which should be of a telescopic or sliding pattern.

FIG. 30.

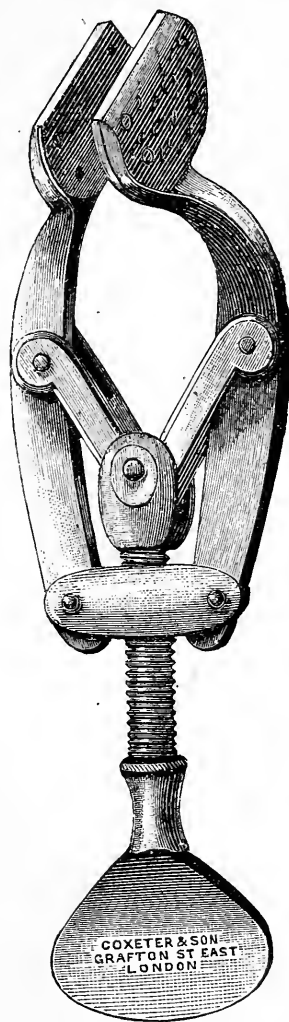


A telescopic gag or mouth prop for use during inhalation of nitrous oxide. It should be placed between the front teeth before the gas is inhaled.

Chloroform is useful when many teeth have to be extracted, or when from nervousness and absence of deep

breathing the gas is contra-indicated. In a word, with a weak heart use gas rather than chloroform, and for a nervous hysterical female employ chloroform rather than

FIG. 31.



A mouth opener to be used with the administration of chloroform.
gas. The administration of chloroform for dental pur-

poses should never be pushed to any extent, and before stertor and relaxation of the muscles show that the third stage of anæsthesia has been reached, the mouth should be forcibly opened by a powerful screw gag placed between the upper and lower bicuspid teeth. The gag should be held by an assistant between the bicuspids while the operation is completed, and thus, while the sense of pain is dulled or entirely removed, we avoid causing that nausea and prostration which generally follow upon a large use of chloroform.

Ether is used at times for patients of middle age, but for dental purposes is not very convenient. It causes great excitement, salivation, and bronchial irritation, also its pungent vapor is apt to inconvenience the operator.

The undesirability of employing any anæsthetic, be it gas, ether, or chloroform, without the presence and assistance of a companion, who should be a qualified medical practitioner, needs hardly to be indicated.

The preparation of the Mouth for the Insertion of Frames.—Artificial teeth are now made of mineral materials only, and are carried on a base of either gold or vulcanite.

They are worn for the sake of appearance, and to prevent lisping during speech, as when an artificial incisor is adopted; to restore or increase power of mastication, as when molars and bicuspids are inserted; or to serve as props when all the back teeth of one or both jaws have been lost. Thus they prevent the lower jaw from approximating too closely to the upper, and so directly tend to preserve the upper front teeth, which would otherwise be bitten out and loosened by the increased pressure upon

their back surfaces of the lower incisors and canines. This last is certainly not one of their least useful duties. Further, by keeping the jaws apart, they prevent that protrusion of the inferior maxilla, and raising of the chin towards the nose, that characterises the aged.

After deciding from any of the foregoing reasons that frames should be worn, it is usually desirable that any greatly decayed, or very loose teeth, or tender stumps should be removed; and after such extractions an interval of from a day or two to six months should elapse before the models of the mouth are obtained to which frames are to be made. The wax impression should indeed not be taken until absorption of the alveolar process is well advanced or completed. Only a short delay, however, need occur if before their removal the extracted teeth have been very loose, since already much of their sockets has disappeared; and if there be necessity for immediate wearing of artificial teeth, the impressions may be taken within a week or so of the operation. From these a temporary frame may at once be made, to be replaced by one of a more permanent character at the end of a year or so, when the alveolar ridge has settled down somewhat to its ultimate level.

Tartar or Salivary Calculus.—This earthy deposit, which consists of lime salts with animal matter, is found to collect around the teeth under these circumstances.

I. At the back of the lower incisors and canines, which is a part of the mouth always escaping that friction from the tooth brush and from the passage of food during mastication, which tends to polish the surface of the teeth and to prevent lodgment thereon of calcareous particles.

II. Upon and around any masticating tooth which from decay has become tender to pressure and change of temperature, and so has got thrown out of work. Thus, if from a tender molar the side of the mouth on which it is placed is unused, the buccal and lingual surfaces of molars and bicuspid's of both upper and lower jaws on that side will shortly become much coated with deposit, and its occurrence may be accounted for, as in the previous case, by the absence of the cleansing influence of friction.

III. Towards middle life upon the necks of teeth which from absorption of the alveolar process and gum are becoming exposed, and probably in such cases the growth of the deposit is but a sequence to the absorption and in no manner its cause.

The removal of tartar may be readily effected by detaching it from below upwards with a strong excavator, and thus it may be scaled off the surface of the teeth, which should if loose be steadied with the fingers of the left hand. Its formation is undesirable since it is apt to induce an irritated state of the gums and to form a lodgment for particles of food.

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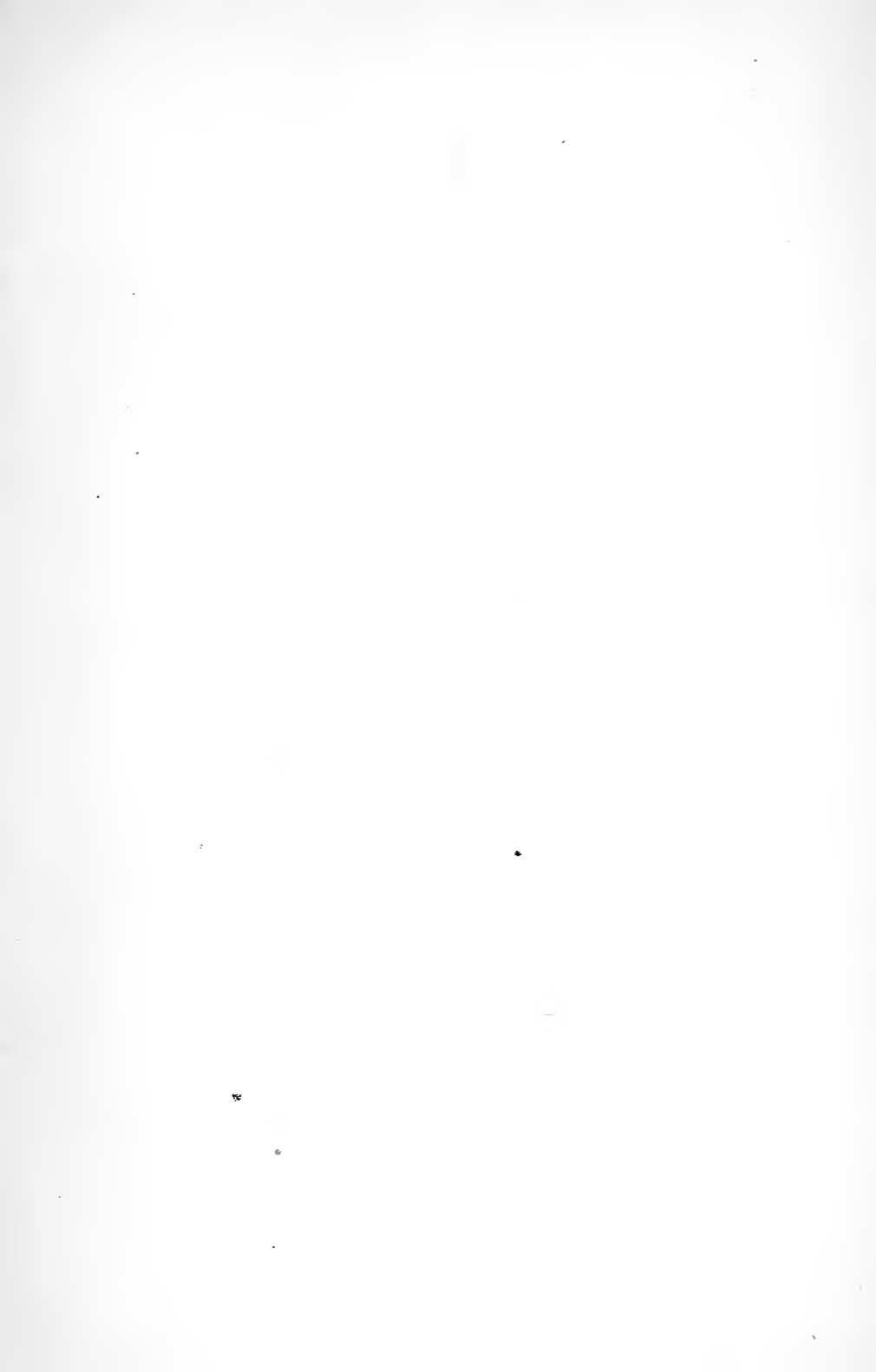
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